

# electron

A Database Publication

Vol 4 No. 10 July 1987 £1

## user



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adventures

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in our  
3D maze

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wonderful  
world of graphics

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Electron!



# The Superior Collection

## Volume 3

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Acorn Electron

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RELEASE



SYNCRON

Voted  
COMPUTER  
GAMER'S BBC  
OF THE  
YEAR 1985



REPTON



REPTON 2



KARATE COMBAT



DEATHSTAR



MR. WIZ



SMASH AND GRAB



OVERDRIVE

## A New Concept in Compilations

The Superior Collection Volume 3 features one brand new game, Synchron, together with 7 of Superior Software's classic hits for the Acorn Electron.

**Synchron** is a fast-action game set against a backdrop of an enormous graphically-detailed scrolling landscape. The landscape is, in total, 1024 times the size of the screen. You must endeavour to complete 16 hair-raising missions; in each mission you have to collect a number of power cylinders, land your spacecraft on a runway with each cylinder in turn, and finally locate and bomb the HQ Building. Whilst skilfully manoeuvring your spacecraft between the defence pylons and force-fields, you are attacked by alien spacecraft and missiles launched from the land bases. A superb game, worth at least £7.95 in its own right.

Acorn Electron dual cassette ..... £9.95  
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Here's what the computer press said about some of the other titles on this compilation package:—

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**REPTON 2:** "Repton 2 is better than anything I've played on the BBC Micro or Electron. Brilliant!" ... ACORN USER

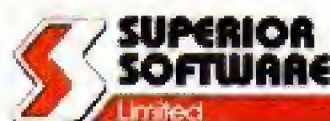
**DEATHSTAR:** "Deathstar is a super fast, all action arcade classic. It's the sort of game that you can't put down ... The graphics are excellent and the scrolling is very smooth in all four directions. The pace is fast and furious even on the starting screen. This action packed game is recommended for all arcade gamers" ... ELECTRON USER

**SMASH AND GRAB:** "As usual with Superior products the graphics are excellent, with a good use of colour and no flicker. I expect this game will have you rolling with laughter. I certainly did.

Instructions	95%
Playability	95%
Graphics	100%
Value For Money	100%
... HOME COMPUTING WEEKLY	

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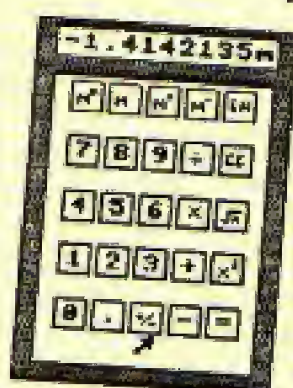
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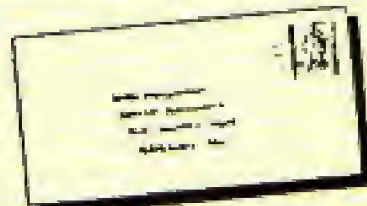
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# electron user NEWS

## ***Electrons are saying it with flowers***

ELECTRON technology is helping people all over the country to say it with flowers.

Interflora, the association of flower retailers, is placing comms equipped micros in all its 2,500 UK member's shops.

The machines – labelled The Interflora Messenger – have been specially built round the Electron motherboard by British Telecom's business systems equipment division.

By November every Interflora shop in Britain will have the equipment, speeding up orders and saving on telephone calls.

The system includes an on-board modem with auto dial and auto answer, VDU, dot matrix printer and associated software.

Installation follows a successful trial with 50 shops in various parts of the country.

"Once we got the Electron we knew we had the right machine for the job", said Keith Bentley, Interflora's head of communications and computer services. "The main problems have been with the software and the dot matrix printer.

"The original printer was not good enough and kept jamming, and the software which is stored on rom proved difficult, but that has

all been sorted and the system is now working perfectly".

The cost is being met by Interflora, with the retailer paying a small handling charge on each order.

Thanks to the new Electron-based system the average order can be sent in less than 20 seconds – instead of four minutes by telephone.

Jill Carless of Tracys florists



*Jill Carless operates an Interflora Messenger*

in Merseyside said: "At first I was apprehensive about using computers, but the system is really easy to use.

"It's good for business

because we can serve customers while orders are transmitted instead of wasting time on the end of a telephone line".

## **It was all go at the Show**

**THE London Marathon may have taken place the same weekend but the real winners were to be found at the 16th Electron and BBC Micro User Show.**

A survey of exhibitors showed that visitors saved at least £500,000 by taking advantage of more than 200 special offers at the three-day event.

"We were delighted to see the way the exhibitors once again joined in the spirit of the occasion", said Derek Meakin, head of show organisers Database Exhibitions. "They offered special show prices on everything from hardware upgrades to

arcade games".

But there was more to the show than just bargains. Once again it was a showcase for everything new in the Electron marketplace.

Business was brisk everywhere, but nowhere more so than on the ACP stand where the 32k Advanced Battery Backed Ram was a big seller. Plus 1 and Plus 4 stocks were exhausted, and the new 16k Advanced Control Panel rom received an enthusiastic welcome from Electron users.

Sales at the Electromusic Research stand were so good they turned the show into an adventure for company boss

Mike Beecher.

He quickly sold all his Midi interfaces and music software stock – including his own master disc – and had to send for fresh supplies.

When he left the show he found his van had been clamped, he scraped the vehicle when driving off, and got to Southampton before discovering that he'd left the new master disc behind.

Returning to London, he found cleaners removing the last litter from the hall and had to dive into a rubbish skip where he found the disc under eight feet of show refuse. "Thank goodness it was undamaged", he said.



## Knit one on your Electron

A BOYHOOD holiday introduced Kendall Down to knitting which has culminated in him writing a sophisticated suite of pattern design programs for the Electron.

Fascinated by his mother's busy needles as a 12-year-old youngster he asked to be taught to knit – and acquired a skill that is serving him well as an adult.

Marriage and the eventual need for baby clothes rekindled his interest in knitting, and these days he produces most of the woollies worn by his wife Shirley and sons aged six, 11 and 14.

"I finally rebelled at the prices charged for knitting patterns and wrote a program to design and produce printed instructions for sweaters", said Kendall, who is a clergyman in North Wales.

That initial program has grown into a package of five Electron knitting pattern programs, complete with detailed instructions.

Users can produce patterns for square and drop sleeve pullovers and also design their own distinctive knitware. Details are on Page 23.

## Top marks for the school tycoons



Christopher Read (left) and Colin Chappell . . . their accent is on educational programs

WHEN 13-year-old Colin Chappell devised his first computer program, he decided the ideal customer would be his school.

Teachers at Welling Secondary in Kent gave top marks to the program, French Tenses, to give Colin the incentive to carry on.

Now – four years later and still at school – Colin operates Chestnut Software (01-308 2981) from his home in Bexleyheath.

Producing games with an educational basis for the Electron, he is helped by another 17-year-old, Christopher Read, who acts as sales and marketing manager.

The enterprising duo has also won the backing of their local Bexley Borough Council who include Chestnut's programs at its educational software open days.

The latest releases for the Electron from the teenagers involve subjects that are definitely not on the normal school timetable. Enigma is a dice game for six to eight players, while Tipster analyses horse racing data to predict winners.

## Emulate Hercules

AN Electron version of Hercules has been released as a budget game by Power House.

Based on the Twelve Labours of Hercules from Greek mythology, it is a platform game with a difference.

The 50 frames lead the player through the first 11 labours at random. Only when these are completed can the 12th be attempted.

But the platforms and ropes are not always visible and even when the player has worked out where one should be it might have gone next time – or might burst into flames on impact.

Power House (01-258 3999) say they have more games on the way for the Electron, including Freedom Fighter.

## The Thunderstruck winners

WE had an overwhelming response to the Thunderstruck competition in the March issue, and were surprised at the number of words you found in AUDIOGENIC. However some people's imaginations got the better of them, and we came across words which we could not find in any dictionary. Here are the final results:

Stephen Lodge from Wakefield will be receiving the complete Audiogenic range – Thunderstruck 1 & 2, Bug Eyes 2, Psycastria, Last of the Free, Frankenstein 2000, Caveman Capers, and Electron Power Pack.

The second, third, fourth and fifth prize winners will

each receive Thunderstruck and the Electron Power Pack compilation – Marco Muia of Lancaster, Paul Day of Colchester, Emily Clarke of Maidstone and EA Cook of Llanfrechfa.

The 45 runners-up will be sent a copy of Thunderstruck: G Laurence, Macclesfield; J Stinchcombe, Sherborne; KT Millar, Sherborne; WG Newman, Chapel-en-le-Frith; RD Charlton, New Marston; EY Whyte, The Netherlands; A Norfolk, Leeds; DG Corner, Stonehouse; R Arnfield, Southport; MJ Hopewell, Nottingham; P Robertson, Denny; H Vance, Larne; J Acton, Bath; B Orchard, Bristol; D Jackson, Portadown; G Seager,

Enfield; S Bailey, St Austell; P Jones, Flint; C Yule, London; C Morris, Port Talbot; D Rich, Ripon; S Bain, Hamilton; M Malby, Hornchurch; P Noble, Bicker; A G Russell, Burnley; D Crawley, Fordingbridge; S O'Gorman, County Galway; S Fortescue, Basford; R Stuart, Watford; WA McMillan, Andover; PD Bailey, Burton on Trent; M Count, Hull; K Malone, Ramsey; R Pallett, Horndean; M Brooks, Wylam; D Knight, Lerwick; E Robertson, Troon; M Collis, Burwash; J Wright, Long Sutton; R Auty, Connahs Quay; DL Riley, Keighley; A Gilmartin, Otley; M Jones, Headington; R Nassehi, Epsom; SM Ovenell, Bexley.



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# Bright ideas win prizes

SO many people entered the recent Advanced Computer Products competition in *Electron User* that it has taken several weeks just to sort through the mini-mountain of mail.

"The quality of entries was so impressive it would have been a crime to rush the job", said ACP boss John Huddleston.

"The effort put in by nearly 1,000 entrants was unbelievable – it's a pity we couldn't give them all a prize".

To win more than £500 worth of prizes, contestants had to make a practical suggestion for a new ACP product for the Electron.

Winner of the first prize, an AP5 interface plus AMX mouse package, was Kevin J Robinson of Morpeth who suggested an internal sideways rom board to fit inside the Plus 1.

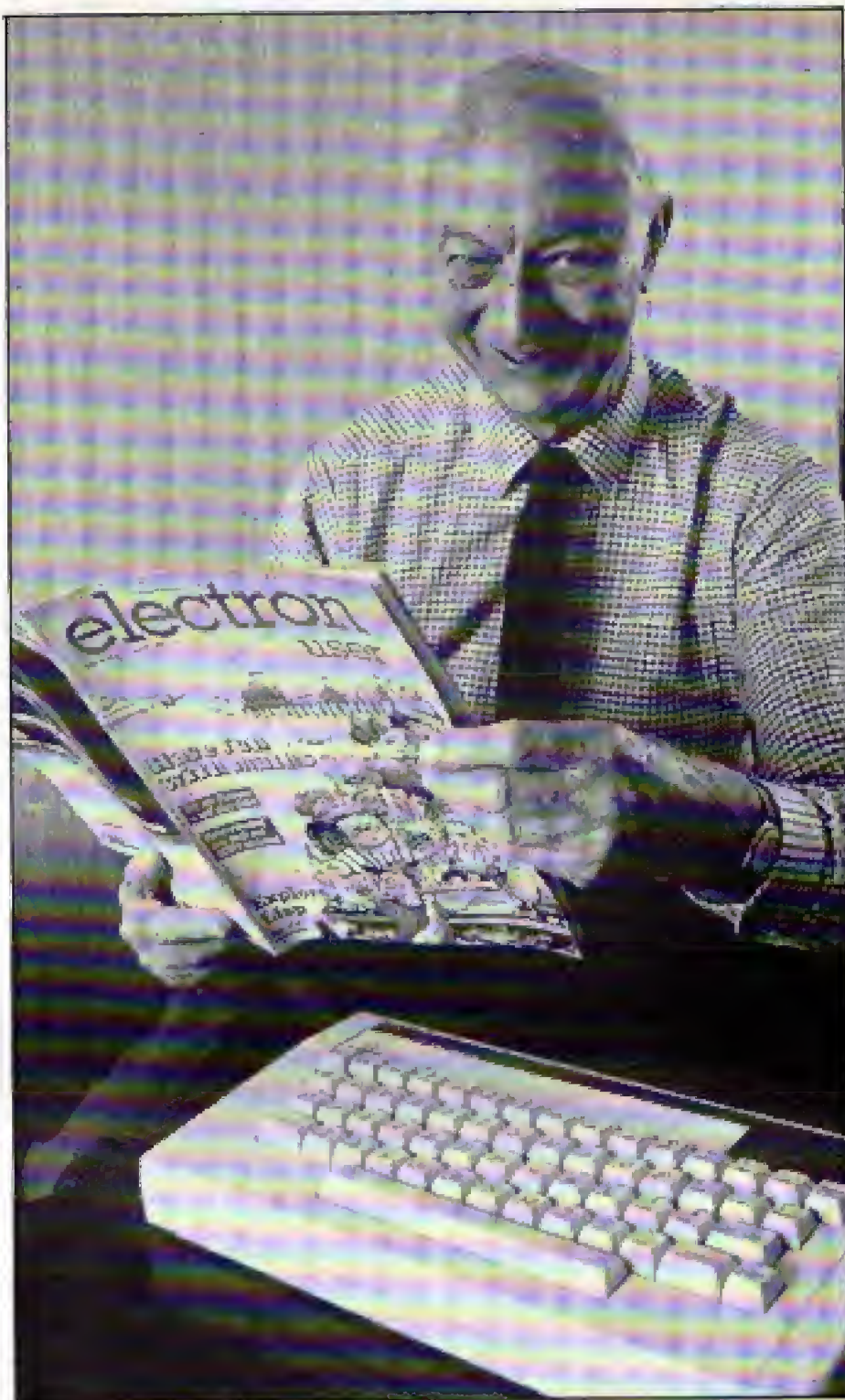
"We had to choose this practical and commonsense idea because it concurs with a product we are already working on", said John Huddleston. "Its design is simplistic and easily fitted".

Second prize of an Advanced 1770 DFS and Advanced Rom Adapter II goes to R W Dean of Wolverhampton who suggested a joystick interface and keyboard expander.

"This also coincides with something we've been looking at", said Huddleston. "If it can be done it means almost every Electron game could be joystick controlled. It's an idea we'll be considering very seriously".

Third prize of an Advanced Rom Manager and Advanced Rom Adapter I went to N R Jones of Purley who suggested an Advanced Sound System.

"It looks pretty incredible", said Huddleston. "It even includes output to a mouse. It may not make a viable product, but a lot of work went into designing it so it certainly deserves an A for effort".



A 73-year-old man who was made redundant when his firm brought in computers has embraced micro technology with the help of *Electron User*.

Computerised warehousing meant transport manager Ron Panting had to leave the firm where he had worked for 43 years.

Instead of stagnating at his home in Bromborough, Merseyside, he found dozens of ways to keep himself busy.

The latest is computing – a hobby inspired by his granddaughters getting an Electron as a Christmas present.

A quick trip to Dixons and a £50 outlay brought him his own machine and an activity to share with the girls when they visit him from their home near Wolverhampton.

"I've had an interest in electronics since building primitive radio sets as a boy so the technology didn't scare me like it might other older people", said Ron. "In any case I enjoy using my brains.

"I've spent many enjoyable

## Micro life begins at 73

hours learning the intricacies of Basic, and typing in programs from *Electron User*.

"As my reflexes – particularly fingers – are not as good as they were, commercially produced games are far too quick for me.

"Even those I type from *Electron User* for my granddaughters use are in the same category – but I can usually amend these to make them more amenable for my use.

"With the help of *Electron User* I've been able to build up a stock of games to keep my granddaughters amused as well as some more practical programs for my own enjoyment".

## Super graphics on the way . . .

A FORECAST that within two years games running on Electrons will have graphics comparable with those on the inlay cards has come from a leading developer.

Dave Croft of Tynesoft (091-414 4611) believes that a technological breakthrough is just around the corner.

"Our programmers are working to improve graphics all the time", he told *Electron User*.

"We are expecting the major advance to come from a possible combination of video and computer images".

Dave Croft currently heads a team of five in-house programmers and 12 outside writers working for Tynesoft.

Their success has been so marked that the software house is considered to be a front runner in the industry.

One of its titles, Winter Olympics, has now been in the bestselling charts for more than a year while another, Commonwealth Games, has been in the Top Ten for the six months since it was launched.

Last year Tynesoft broke through the £1 million sales barrier for the first time.

Sales in the Electron and BBC Micro markets accounted for a sizeable amount of this", says Dave Croft. "They are brilliant markets for games – but they have to be good".

## MOUSE AID

NEW from Wigmore House is Mousemate, an interface which allows the use of digital input devices with the Electron and Plus 1.

Together with a mouse the interface gives a degree of cursor control never before possible on the Electron, claims Wigmore (01-734 8826).

Mousemate, priced £29.90, is supplied with Wigmore's graphics and design package Mousepaint on cassette for £39.90.



SO far in this series we've concentrated on the Plus 1. We'll now take a short break and look at Advanced Computer Products' Plus 5, which gives the Electron a user port, Tube and 1MHz bus.

I'll concentrate on the user port as this can be used for simple hardware projects and we'll see how to make the most of it. Don't worry if you haven't got a Plus 5, everything will work equally well with Project Expansions' user port.

Your first question might be: "What is a user port and why do I need one?" Well, the user port is just another way of allowing the computer to exchange information, in the form of electrical signals, with the outside world.

Note that I said exchange – the user port allows the computer to send signals to the outside world as well as receive them.

The analogue port in the Plus 1 is a one way device, just allowing the computer to receive information.

A user port forms a two way, or bidirectional connection. There are eight separate channels, or lines and each line can carry a single electrical signal either to or from the Electron.

The big difference between a user port and the Plus 1's analogue port is the type of electrical signal carried. The analogue port accepts an input voltage between 0 and 1.8 volts and converts this into an 8 bit number.

Each input line of a user port will respond only to inputs of either 0 or 5 volts from the outside world and when used as an output from the computer will give an output of either 0 or 5 volts.

Such a system, with only two voltage levels is a digital one.

The Plus 5 user port,

along with many others, is treated by the Electron as a memory location so you can use the ? indirection operator to transfer information between the Electron and the port.

Because of the eight lines, the numbers passed to the user port are in the range 0 to 255 – eight bits as shown in Figure 1.

When used for output each zero in the byte that is written to the user port will cause the corresponding line to go to 0 volts and each one will cause the corresponding line to go to 5 volts.

If used for input, the byte read back from the port address will reflect the pattern of 0 and 5 volt signals on the input lines of the port.

Each line set to 5 volts is read back as one and each 0 volt input will be read back as zero.

The user port allows you to connect the Electron to a variety of other electronic circuits, switches and so on.

For instance, you could control a simple robot buggy or a model train layout, receive inputs from light or heat sensitive switches and even decode morse code from a radio. The uses are limited only by your imagination.

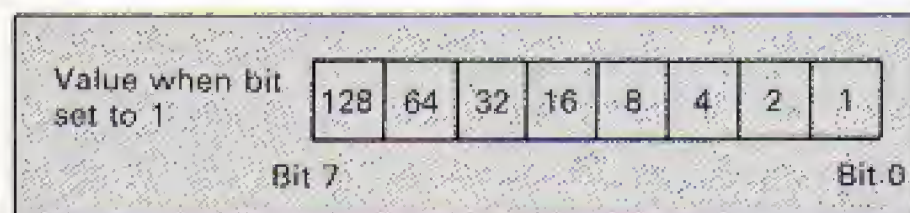


Figure 1: The eight bit values of the user port

# CONNECTING UP YOUR USER PORT

**JOE PRITCHARD shows how to make the most of ACP's Plus 5**

So let's get down to a detailed look at the Plus 5 user port.

It is based on a very sophisticated chip called the 6522 VIA (Versatile Interface Adaptor). It's the same one as used in the BBC Micro's user port and occupies 16 bytes in the Electron's memory map.

Each of these bytes represents a register inside the 6522 as shown in Figure II, and each controls some aspect of the behaviour of the chip.

It has two separate input and output ports, one of which is available to us on the Plus 5.

In addition it offers timing functions and a few other

facilities which we won't be covering in this brief three part introduction. However, we may come back to the 6522 later on in the series.

In this introduction we'll be interested in two of the 6522 registers – those at &FCB0 and &FCB2. These are called IORB and DDRA respectively – abbreviations for Input Output Register B and Data Direction Register B.

The first is the actual user port and the second controls which lines of the port are used for input and which for output.

When we use a 6522 based user port, it's crucial that we tell the 6522 which lines of the port (address

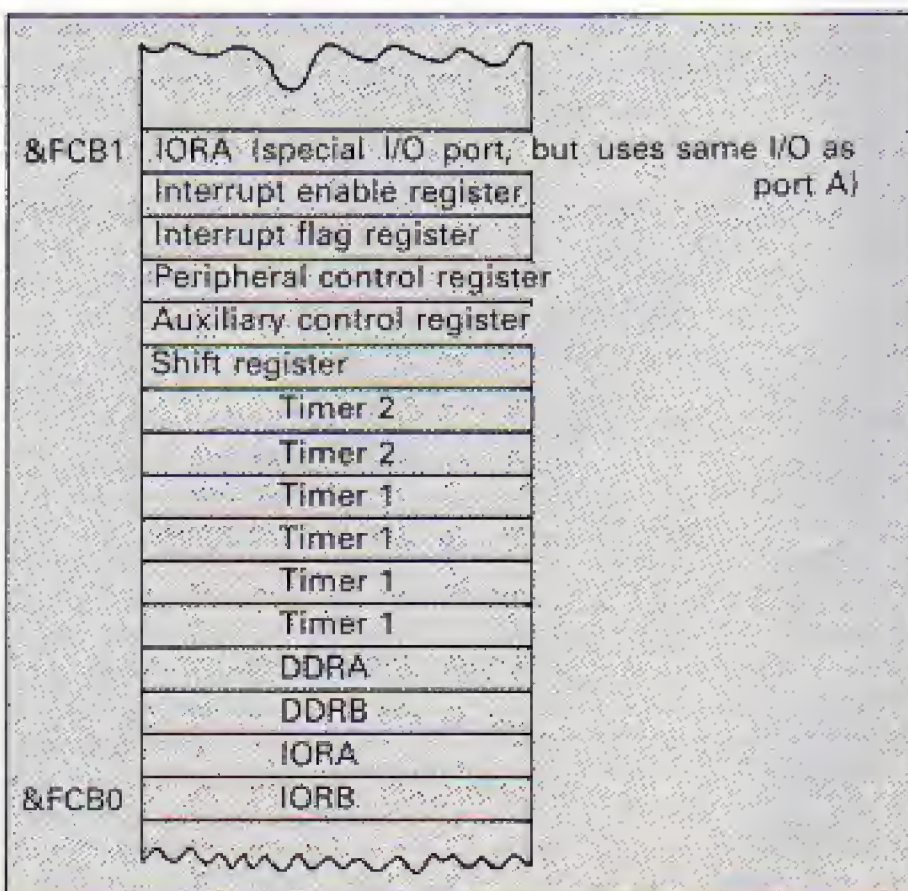


Figure II: The 6522 VIA's registers



## Hardware Projects

&FCB0 in this case) are to be used for input and which for output.

Splitting the user port into a mixture of input and output lines will obviously reduce the number of each we can use; for example, if we need six output lines then we're only going to be able to have two input lines. We couldn't have eight of each.

Setting which line is to be an out and which an in is easy; for an output line simply set the corresponding bit of `&FCB2` to one.

For an input line, set the bit to zero. In Figure III we've set up bits 0 to 3 of `&FCB0` to be outputs and bits 4 to 7 to be inputs. The command used to write to the `DDRB` register would be:

78 FCB2=80F

However, this won't work if you've got a second processor connected as the ? operator will write to the second processor's memory. Instead, we use an FX call:

\*FX147, 178, 15

The first parameter, `&B2` in this case, is the offset from `&FC00` of the address to which you want to write.

The second is the value that you want to write to that address. If we wanted to set all the bits to be outputs, we'd issue:

781 CB2=255

Similarly, for writing a value to `&FCB0` we can use:

$$? R.F. \vdash R.Q = 0$$

where  $n$  is the value we want to write to the port.

It's quite possible to damage the user port if you try putting an electrical signal from an add-on circuit of some sort into a user port line that has been set up as an output.

Be very careful when setting up the DDRB register – if a user port line isn't going to be used as an output, set it up as an input even if you're not going to be using it.

So if we're only using line

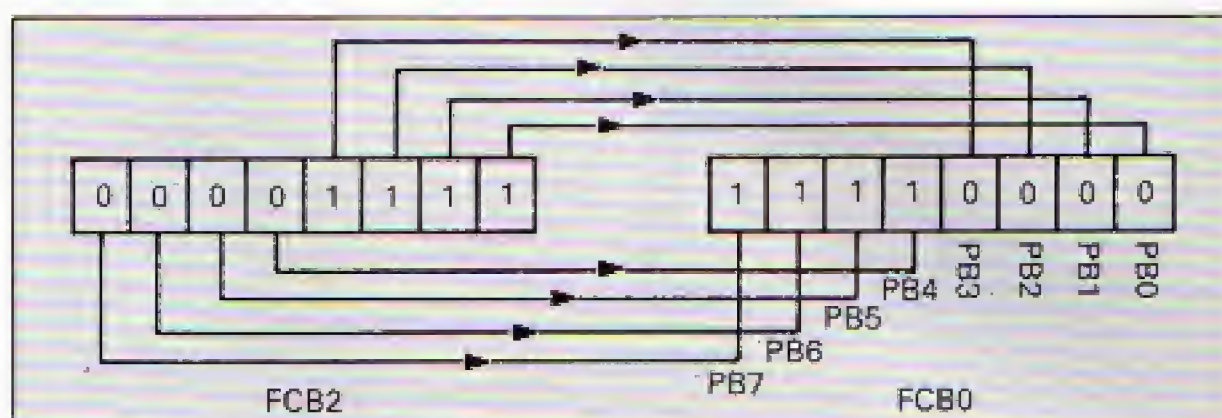


Figure III: The IOAB and ODAS

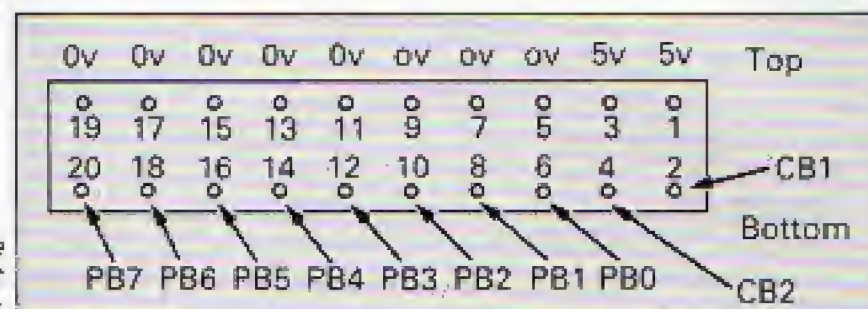


Figure IV: The Plus 5 user port pin-out

0 as an output and we're not using any of the other lines at all, use:

 $\gamma_{FCR} = 1$ 

to set bit zero as an output  
and the others as inputs.

After that word of caution, don't panic; I've yet to damage a VIA and with a little care you should have no problems. Just follow the instructions given here and you'll soon get the hang of things. The major practical

problem with using the user port is the connection to it.

Figure IV shows the pin out of both the Plus 5 and the Project Expansions user port. It's the same as the BBC Micro's user port.

The PB lines are the In/Out lines of the user port – 5V carries 5 volts and 0V is the same as the digital ground of the analogue port. CB1 and CB2 are special purpose I/O lines which don't concern us just yet.

The connector you'll need

for our projects is called a 20 way Female Insulation Displacement Connector, usually called a 20 way female IDC. Don't try soldering directly to the pins on the user port.

To use these connectors properly you'll need a special tool which allows you to squeeze the plug on to a suitable cable.

However, if you can't get hold of the IDC crimping

Turn to Page 12 ►

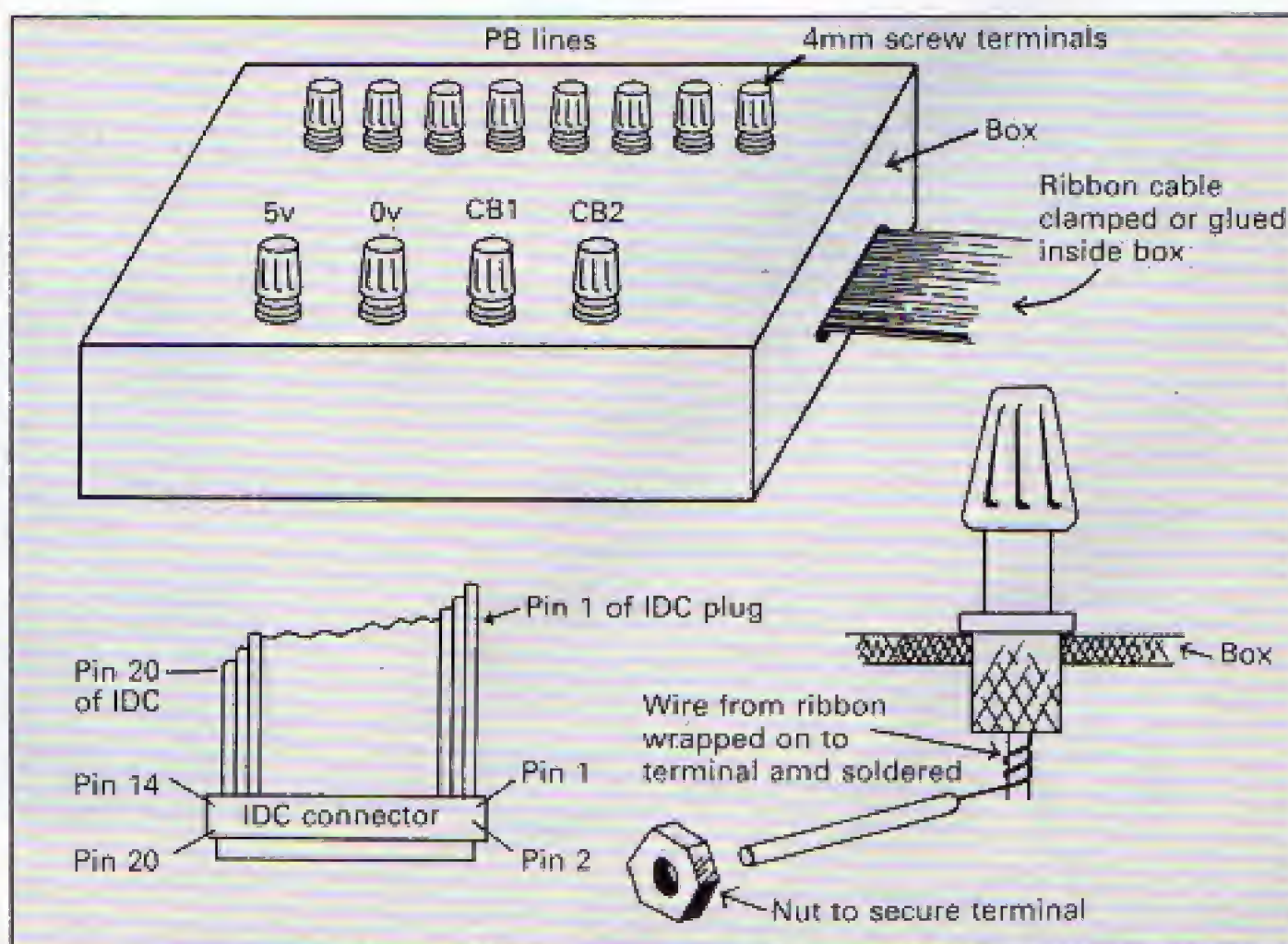


Figure V: Connecting up the user port



# Hardware Projects

◀ From Page 11

tool (which comes with full instructions) it is possible to solder the connector with care.

The best sort of connector is ribbon cable, in which several separate wires are moulded in plastic to give a wide strip.

We want a length of 20 wire, or to use the technical jargon, 20 way ribbon cable. Get a piece about one metre long, so you can position whatever you connect to the user port a reasonable distance away from the Electron.

For the sort of experimental work we'll be doing, I use the box shown in Figure V. All the components are available from Rapid Electronics, Hill Farm Industrial Estate, Boxted, Colchester, Essex.

All we're doing is connecting the user port pins to the

4mm terminals so we can connect anything up to the port without having to solder and desolder connections to the IDC connector.

I've connected all of the I/O lines to terminals, including the CB1 and CB2 lines, and have bought out the 5V and 0V connections.

This uses a total of 10 terminals: 8 green ones for the PB lines, red for the CB lines 5V and black for 0V.

I used a fairly large plastic box from Tandy, but a wooden box or even a plastic sandwich box of suitable size would do.

You shouldn't have any difficulty wiring it up. The only problems are at the IDC end. If you solder, take care not to splash the neighbouring pins, especially the 5 and 0V ones.

Once you've built the box, check the connections to the IDC connector in a good light, with a magnifying

```

10 REM Program 1
20 MODES:VDB:19,0,4;0;
30 PROCassem
40 REPEAT
50 PRINTTAB(0,1)Port re
ads:;CALL&000
60 UNTIL0
70 DEFPROCassem
80 data=&70
90 FOR N:=0 TO 2 STEP 2
100 P:=8000
110 TOPTN%
120 SE1
130 LDA #0
140 STA &FCB2 \ DATA DIR
ECTION REG.
150 LDA &FCB0 \ PORT B I
NPUT
160 CLI
170 LDX #0
180 STA data
190 .loop
200 ASL data
210 LDA #0
220 ADC eASC0
230 JSR &FEE
240 DEX
250 BNE .loop
260 RTS
270 3
280 NEXT
290 ENDP

```

Program 1

glass if necessary.

We'll check the box by getting the Electron to read from the user port. Type in Program 1 and run it.

The DDRB is set to make all the PB lines into inputs, then the program loops, reading IORB and printing the result returned to the screen. Use a piece of wire to connect each PB terminal

in turn to 0V.

Don't connect the 5V line to 0V though, you'll crash the computer. As you connect each terminal to 0 the number displayed on the screen will change.

● Next month we'll look at inputs and outputs from the user port in greater detail and see how we can put them to good use.

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## Pinball wizard

**Product:** Video Pinball

**Price:** £1.99

**Supplier:** Alternative Software Limited,  
Unit 3-6, Baileygate Industrial Estate,  
Pontefract, West Yorkshire.

IT is good to see more firms getting involved in budget priced software and Alternative Software have now joined this growth industry with a pin-table simulation.

Just as on a real pin-table, the controls are simple. The spacebar is used for the plunger which pushes the ball onto the table.

The speed of the ball can be varied by adjusting the time you hold down the spacebar. Once in play, the ball bounces off the various obstacles.

These obstructions not only decide your score, but make rapid changes to the speed and direction of the ball. When it falls to the bottom of the table, you can push it back using the Z and ? keys control the left and right flippers.

With subtle use of the flippers, you can aim the ball to the bonus channel at the left of the screen. Success will cause mayhem to break out as num-

bers and colours flash everywhere and a bonanza of sound occurs. You should also aim to get the ball to pass through each of the channels at the top of the table so that the letters B, O, N, U and S all change colour and give your score a healthy boost.

Inevitably, the ball will either fall down one of the drains at the side – you can do nothing about this – or you'll miss a ball with your flippers. In either case you can now move on to your next ball.

Altogether you get five balls, and the game is for up to four players. Each competitor uses one ball in turn and all aim to reach the high score table.

The nature of a pin-table does not make for exciting animated graphics. Video Pinball has a tidy screen and the simplicity of the action makes for smooth but rapid movement. You can slow the game if you wish by selecting the BBC Micro option.

The choice of colour – white ball on a yellow background – is poor, both in colour and black and white. Sound effects are really rather good.

The bleeps and buzzes have an



authentic flavour, but there should be an option to turn them off. No method exists within this software, although \*FX210,1 before loading will kill all sound.

I have one criticism of the pin-table – it is not possible to catch a ball on the flippers to get real control over direction. That apart, Video Pinball is a good simulation and quite addictive. The style of the software is somewhat dated, but at £1.99 represents good value for money.

Rog Frost

Graphics.....	6
Sound.....	7
Playability.....	7
Value for Money.....	8
Overall.....	7

## Mechanic's adventure

**Program:** Magnetic Moon

**Price:** £4.95 (free to Elk Adventure Club Members)

**Supplier:** The Elk Adventure Club, 2 The Beeches, Tilbury, Essex RM18 8ED.  
Tel: 03752 4860

MANY potential text adventure authors who haven't the programming skill to write their own machine code epics can thank Gilsoft's The Quill for cutting away their shackles.

Larry Horsfield, the author of Magnetic Moon, is a case in point. Electron adventurers would not have been able to savour the delights of his imagination without an aid such as The Quill.

Although lacking the text compression – and hence the atmosphere – of the likes of Enthar Seven, Magnetic Moon is a revelation. It is a flight of science fiction fantasy with the feel of a Robico masterpiece.

You are Mike Erlin, second lieutenant of the United Planets Survey Service Spaceship, Stellar Queen. While searching for your sister ship,

Stellar Princess, you discover an Earth-like planet with three moons.

Suddenly, a powerful tractor beam forces you to crashland on the moon where you are held in a dynamic magnetic force field. As a maverick hero, you have to free your ship, and gripping stuff it is too.

The game loads in three parts and each must be completed to go on to the next phase.

Part one is called Search for Source of Power and you will spend a lot of time and energy collecting much needed artifacts to continue the quest. You need to escape from the Stellar Queen without the captain or crew noticing, then examine the wreckage of the cabin.

My advice is to LOOK UP and LOOK DOWN continually. Throughout the adventure, careful examination and manipulation of potentially useful objects is essential to success.

The start is one of the trickiest I have come across and the problems don't get easier as the game progresses. It's



a bit of a mechanic's game with all the mending and manipulating involved.

All in all a most enjoyable mental exercise which I recommend to the experienced adventurer. However, the novice should not be daunted as the Elk Adventure Club offers an excellent help service.

Pendragon

Presentation.....	4
Atmosphere.....	7
Frustration Factor.....	9
Value for Money.....	10
Overall.....	8





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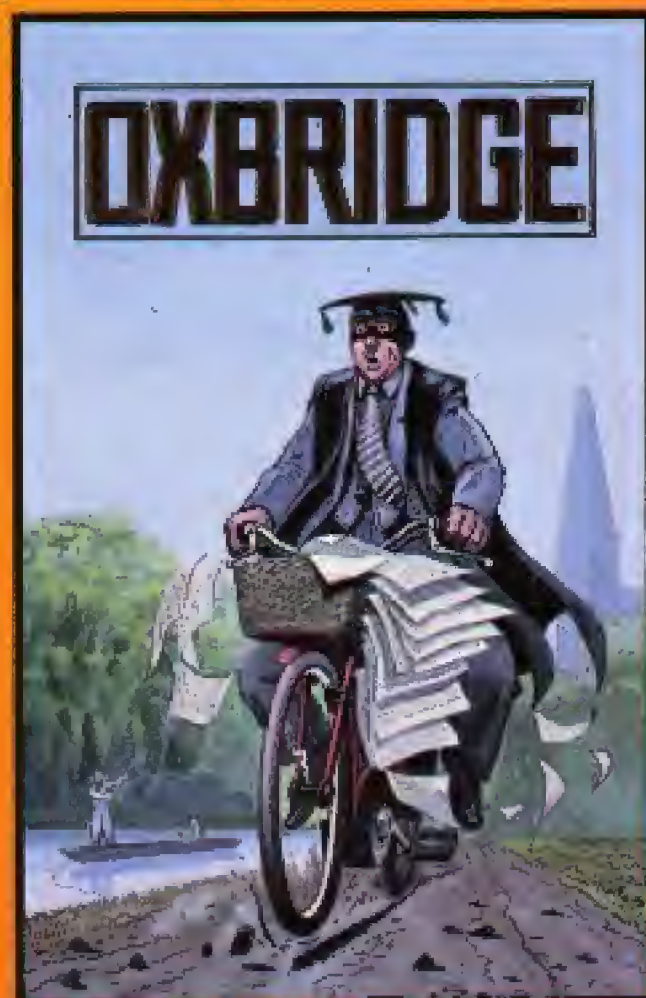
Oxbridge is an Adventure which takes a light-hearted look at the world of higher education. The cursor keys move you about a beautifully illustrated landscape to meet various brain-teaser type problems. If you like puzzle books, you'll love this game. It is no marathon science-fiction epic taking hours to get into. You make progress within minutes and as you play you absorb the atmosphere and folklore of the world's most famous university.

The author is an Oxford-based mathematician and puzzle composer who has used his skills to pack an incredible 300+ pictures into the BBC's memory. facility, mobile talking cha personalities!), single operatio graphics.

Nothing like it has ever been prod

\*Electron version has 200.

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## PHANTOM



Something strange has been happening, something unnatural. At first no one took much notice, those who'd experienced it were considered crackpots by those who hadn't. But now people are noticing, the so called 'crackpots' now outnumber the disbelievers.

And so the scene is set. As a Professor of Astro-Physics with more than a passing interest in Psychic Phenomena you are well prepared for the situation. Equipped with your experimental nuclear accelerator you prepare for what could be the world's final conflict, one dimension against the other, life versus death. And so the war begins.....

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**TYNESOFT**  
COMPUTER SOFTWARE



## Cheap, but not cheerful

Program: *The Hacker*

Price: £1.99

Supplier: Firebird Software, 64/76 New Oxford Street, London WC1A 1PS

Tel: 01-379 6755

QUITE a lot of budget software has been released recently, some of which compares favourably with games costing up to three times as much.

Unfortunately, some only serves to give other budget software titles a bad name and in my opinion this game falls into this category.

It is of the platform and ladders genre, having 12 separate screens. A new one appears only when the previous one has been completed, though there is a practice mode which lets you access any screen.

Controls and movement are limited to left, right and jump. Progress is timed, but there is a pause facility enabling you to stop and plan your route. Unfortunately, I found that the movements of *The Hacker* were rather jerky and key response wasn't all I would wish.

The theme is that *The Hacker* has to pass through a terminal and modem into the telephone network. Then it's on into a central computer mainframe through a second modem (this is probably why screens B and F are identical and both titled "Do it the Modem Way").

Any similarity to a real hacker breaking into a real mainframe exists only in the screen titles, with names like *On the Data Buses* which at least gave me a chuckle, and *Terminally Yours*, which just about reflected how I felt when playing the game.

The sprites are well drawn, being fairly good representations of rom chips, discs, cassettes and the like, but the remainder of the graphics are rather basic and the backgrounds plain.

Sound was virtually non-existent being limited to one monotonous tone as the character walks. There are different tones as he falls or dies on landing.

The screens are difficult to complete, but I wouldn't describe



them as challenging as there doesn't seem to be any incentive to keep trying.

*The Hacker* originally appeared about three years ago when software was difficult to find and arcade addicts a bit less demanding. Software houses would do well to remember that standards have improved and games of this quality can be found as simple magazine listings. My overall verdict: Dull and uninspiring.

Beejay

Sound.....	1
Graphics.....	3
Playability.....	2
Value.....	2
Overall.....	2

## Challenging adventure

Product: *Omega Orb*

Price: £7.95

Supplier: Audiogenic, 12 Chiltern Enterprise Centre, Theale, Berks, RG7 4AA

Tel: 0734 303663

THE latest arcade adventure from the prolific Peter Scott, author of *Thunderstruck II* and the recently re-released *Hunkidory*, is *Omega Orb*.

Peter's games always have a distinctive appearance and feel and this one is certainly from the same stable, although featuring a number of refinements on previous offerings.

You control the *Omega Orb*, a beautifully animated bouncing ball which is the cutest creature I've seen in a long time. I particularly liked the delightful squashy effect produced when the Orb hits the ground.

The object of the game seems similar to that of its predecessor, *Thunderstruck II*: Move the Orb through a variety of multi-coloured locations collecting core pieces – presumably to rebuild the core, although I have yet to find it. A

number of other objects litter the landscape and it's up to you to work out what to do with them.

*Omega Orb* is however, considerably more hectic than *Thunderstruck II* because each new location produces a number of evil-looking creatures with intentions to match.

Contact with any of them reduces it to a cloud of dust, but severely drains your energy.

Furthermore, the game has a nasty habit of leaving the dead creature's dust behind, which again reduces your energy to death level in seconds. Luckily you can rely on your trusty laser gun.

You can only carry one object at a time and collecting or dropping is automatic – you simply jump on it. If you haven't got an object you take it, but if you are already carrying one it will be exchanged for the new one.

If you pause more than about a second the new acquisition will be dropped again.

It is therefore very easy, and annoying, to bounce off with the



wrong object, or even empty-handed.

I haven't managed to get very far into the game yet. However, the screens I have seen have been superb with large animated sprites, used for moving creatures and for many landscape features, allowing you to walk behind the scenery. The plot is a challenge to both mental and physical reflexes.

I found *Omega Orb* a little too similar to *Thunderstruck II*, but nevertheless it is a game well worth looking out for.

Martin Read

Sound.....	8
Graphics.....	10
Playability.....	9
Value.....	9
Overall.....	9



# Ghost Buster?



Program: Phantom

Price: £7.95

Supplier: Tynesoft, Addison Industrial estate, Blaydon on Tyne, Tyne and Wear, NE21 4TE.

Tel: 091 414 4611

WHEN I heard that Tynesoft had released Phantom, described as one of "the new breed of arcade games", I expected an Electron version of the classic arcade game Gauntlet. As usual I was wrong.

The cassette inlay shows two players blasting a rather unpleasant looking, multi-limbed astral misfit and looks quite smart.

The scenario is the present with the player taking the role of an absent minded professor of astrophysics with more than a passing interest in psychic phenomena.

He has long expected the impending catastrophe that is about to befall us - why else would he just happen to have a nuclear powered particle accelerator lying in his back yard?

The game loads and presents you with a start screen reminiscent of Future Shock and just as beautifully designed. Score, reactor level, heart rate in beats per minute (BPM) and electro-cardiograph (ECG) displays are in a window at the bottom of the screen.

In Phantom, as in life, you only get one chance. Each time you bump into one of the ghouls and spectres of the game they give you a terrible fright which increases your heart rate.

Being a bit of an old codger with one foot in the grave already, 100 BPM is a little too much for his old ticker and it'll give up the ghost.

Press S to start and after nerve shattering music enter Ye Olde Inn viewed from above, as in Gauntlet. It all seems very quiet and peaceful, until you discover that the ale must have been like liquid dynamite as deceased customers are very fond of the old place. Needless to say, they're not too keen on strangers and as soon as you put your head round the door they descend like rampant bluebottles.

No problem: Just whip out your new ion cannon and start blasting. Zap! The spooks vanish in little clouds of ectoplasm. Neat little gadget this, since the beam can knock out several of them in one shot.

There is a snag though, and if you like a good old shoot-'em-up then you'd better think again. The backpack has a limited amount of power, and once that's gone you'll have to wait

until you find another isotope pack - it's the one with the coloured top: No other pack looks or lasts quite like it. A few are scattered throughout the game, but remember they don't last long.

To make matters worse your heart rate doesn't settle down from one level to the next. It does add to the fun and doesn't let you relax.

After battling through the four levels of the inn and cleaning up the ghouls you find yourself transported into the dungeon where a completely new set of nasties appear.

Luckily the journey between each new set of screens, which involves some loading from tape, gives your heart time to get back to normal. In all there are 64 rooms between the four houses, the ultimate being the castle, with the difficulty of maze and puzzle quality increasing throughout.

The graphics are superb: The characters are clear and well drawn and the four colours of the Mode 5 display have been used to excellent effect. The animation is smooth and fast, and gets even faster as more spooks appear.

Soundwise the game is nothing to write home about, but this is a limita-

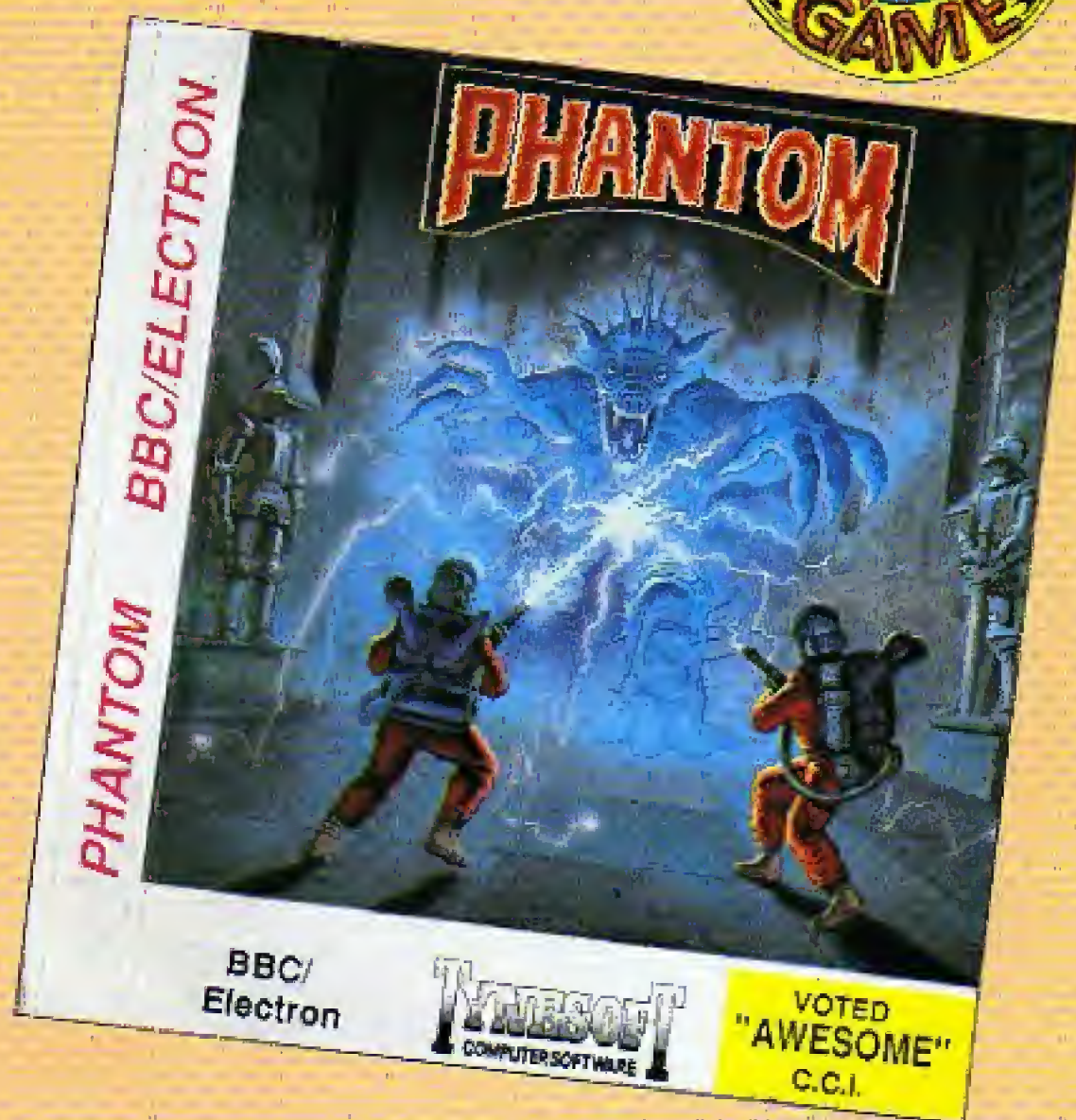
tion of the Electron that has yet to be overcome.

Unlike most other games of this type, Phantom has another surprise up its sleeve. Whereas in Gauntlet your objective was to hack through dozens of screens, in Phantom you have to figure how best to survive to the next level. Evasion seems to be the best tactic, shooting only when you have to. This adds greatly to the game's addictive quality.

There are only two very minor faults. First, the spooks can sometimes strike without you being able to shoot back, though this is not as bad as it sounds, and second the game is a bit slow to restart after you've been killed. This is annoying in such an addictive game.

Those minor criticisms apart, Phantom is without doubt one of the finest games I have ever played on the Electron and anyone, Tynesoft included, would be doing very well to better it.

Mark Smiddy



Sound.....	7
Graphics.....	10
Playability.....	10
Value for money.....	9
Overall.....	10



# Nine Men's Morris

**ARTHUR LINDON** resurrects  
a 3000-year-old board game

WE used to think that Nine Men's Morris was a strange dance, performed in country villages to help the crops grow. Now Arthur Lindon with the help of a little history has put us right.

Nine Men's Morris is a game first played more than 3,000 years ago. A stone slab, engraved with the playing board, found in a tomb dating from about 1400 BC, substantiates this.

Like the original, the computer game is for two players, each with nine counters. The first player to move is selected at random by the computer and play begins with opponents placing counters on the vacant points.

The object of the game is to form one or more mills. A mill is a row of three counters of the same colour in a straight line. When this is achieved a player can remove one of the opponent's counters. But the counter removed must not be part of a mill.

In Figure 1 it is red to go and if he places a counter at B a mill will be formed through A-B-C. He can then remove a blue counter - Q or W is best - preventing blue from gaining a mill through Q-T-W on his next turn.

If a player is reduced to two counters or unable to move he loses the game. Play continues when all the counters have been laid out by sliding a counter along a line to an adjacent point, provided that it is vacant. Again the aim is to form a mill.

If a counter in a mill is moved, as may be necessary in normal play, all counters in that mill, unless forming part of another mill, become liable to capture.

It may be necessary to waive the right of removal and to do this press Z. It is the only time a turn may be missed. To yield to your opponent at any time press Y.

For ease of use, the positions of the counters are referred to on the board by letters, but the computer sees them as numbers one to 24. Three permanent

arrays are set up  $X(n)$ ,  $Y(n)$  and  $Z(n)$ , each array being 25 elements long.

The arrays  $X(n)$  and  $Y(n)$  hold the actual character positions of the counters in the horizontal and vertical directions,  $Z(n)$  holds the numbers of the positions reading the grid from left to right and top to bottom.

For example, the first three numbers in  $Z(n)$  are 1, 10 and 22 which correspond to the grid positions A, J and V.

The two other arrays  $C(n)$  and  $M(n)$  are constantly changing during the

game. The  $C(n)$  array is set to the colour of the counter occupying position  $n$  or zero if vacant and  $M(n)$  is set to one if the counter at position  $n$  is part of a mill or zero otherwise.

In the early stages counters are played one at a time by each player on vacant points using PROCplace.

When the two stocks are exhausted, selected counters are moved along the lines to the next point, provided it is vacant, using PROCmove.

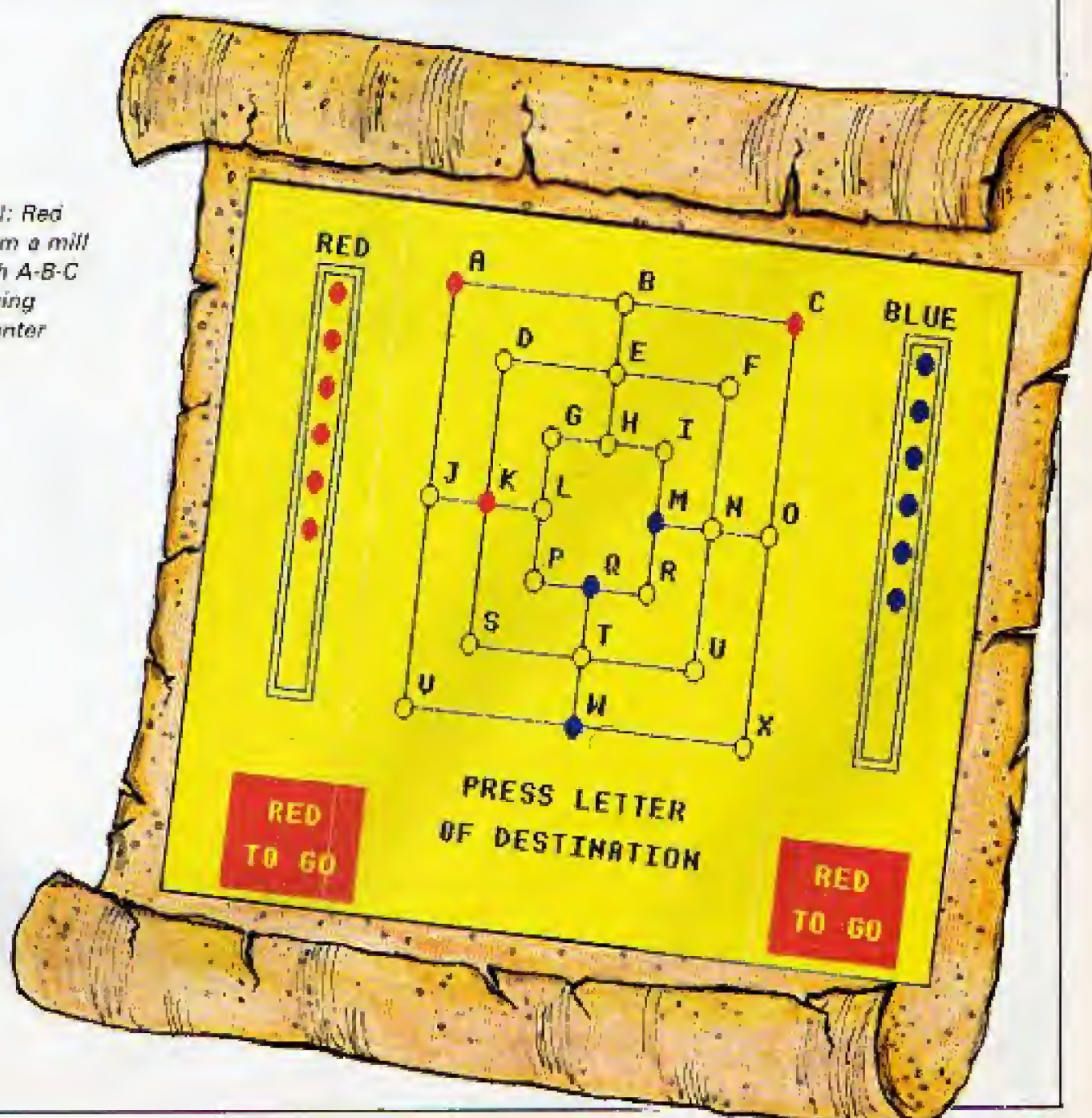
After each turn, PROCcheck checks whether a mill

has been formed. If it has PROCcapture deals with the removal of the opponent's counter.

It may sometimes be necessary for strategic reasons, to move a counter out of a mill during a game (a counter moved out of a mill and back again reforms the mill). PROCreset scans the grid each move to check for the formation of a new mill.

**Full listing starts  
on Page 19**

Figure 1: Red can form a mill through A-B-C by placing his counter at B





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# FRENCH on the RUN!



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France —  
facing the  
toughest test  
that a British  
pilot has  
ever had to  
experience!**

The year is 1943. As an RAF officer stranded in Occupied France you have one aim — to get back to Britain.

The only way to do this is to try to pass as a Frenchman, but if your French isn't good enough you risk capture and interrogation by the police or even the Gestapo.

Even the simplest tasks — from buying food to taking buses — place you at risk. And to add to your problems you've got limited funds: "Should I hitch a lift or take the train?", "Do I sell my belongings or get a job?"

Whatever you decide to do, time is short. And there are always people willing to denounce you...

French on the Run is that rare combination: A truly educational program that's also a thoroughly enjoyable game. This text adventure not only tests your grammar and vocabulary, but your knowledge of France and the French way of life.

And as your French improves the language problems get harder and the situations become progressively more dangerous. There are four routes to complete in sequence — you need the password from the last before attempting the next. The standard of French required is about O level, though on the last route it rises to just below A level.

**And there's a chance for you to try out the French you'll learn in practice:  
We are offering a FREE WEEKEND IN PARIS as a prize to the first person to  
get back to England alive, having broken a code near the end of the final route.**

*For teachers: French on the Run uses multi-choice questions with randomised distractors, all carefully chosen to illustrate linguistic points or points concerning things French. The program is meant for individual assessment, but can be used just as effectively for classroom work. A sealed envelope contains details of how the secret passwords are created.*

DATABASE SOFTWARE

**TO ORDER TURN TO THE FORM ON PAGE 53**



MANY years ago TV and monitor screens were not used to display output from the early computers. Instead, they relied upon a panel of indicator lights.

Similar to those seen in many science fiction films from the fifties, they were known as front-end control panels, and became extinct with the advent of the monitor.

Now ACP has revived the control panel idea, giving Electron users a friendly front-end panel.

Replacing the bulky electronic display, it is supplied as software on rom. To use it you will need a Plus 1 with a suitable rom cartridge or Rombox.

The panel appears instantly on power-up, taking control of the machine instead of Basic. At this point the only major problem many Electron users are likely to encounter becomes apparent – the display is unalterably in Mode 0.

This is necessary for the software but is a nuisance if your screen can't display 80 column text clearly – and this means the majority of televisions.

The control panel provides you with a very convenient interface between you and the micro's more complex functions.

The initial control panel display has four window headers – Language, Mos, File and Panel.

Highlighting Language,

# Touch of luxury

## MARK SMIDDY reviews ACP's Advanced Control Panel

using the cursor keys, brings up a language window.

Under this heading are listed all roms present in the machine that announce themselves as languages. Normally this will be just Advanced Control Panel itself, Basic and the Plus 1 rom.

It is important to note that language roms are not necessarily programming languages, just that their designers included a language entry point in the software. The Plus 1 rom can't be selected even though it appears on the list.

If you have the language cartridges View, Viewsheet, Lisp and so on, these will appear on the menu. Entering a rom from the panel is a simple matter of highlighting the one you wish to use and pressing Return.

Under the heading Mos lie the operating system functions. Some functions listed under this menu and further sub-menus do not directly concern the Electron – the rom can be used on the BBC



Figure 1: The Mos menu

Micro and Master as well.

Clock, for instance, accesses the real time clock in the Master. Trying to access one of these extra functions on the Electron results in the error message: "Not supported".

This should not be a problem, and if you ever upgrade to the heady heights of the BBC Master, you'll have one less rom to replace.

Available under the same heading is a pop-up-calculator that allows conversion between decimal, binary and hexadecimal and simple arithmetic to be performed.

It's a lot easier to use this than to perform the same feats from Basic.

Another useful function under the same heading is the rom list which lists the 16 rom locations allowed by the operating system and their contents, if any.

In this window it is possible to switch off (in effect unplug) any of the roms.

This can be useful for stopping one rom accepting a star command intended for another.

Under the File menu are various functions concerned with filing systems, information on files, changing drive with disc systems and so on.

Finally, most powerful of all, is the Panel menu itself. This enables you to tailor the panel or design a completely new one.

It is possible, for instance, to create a panel which only contains those functions directly relevant to the Electron. Although this is not strictly necessary, it shows what can be achieved.

User defined panels can be saved to the current filing system, ADFS disc for example, and then the panel can be re-entered at a later date with \*ACP followed by the filename.

Advanced Control Panel is supplied with a comprehensive 29 page manual that contains everything to get you started from fitting the rom right up to the more advanced features of the software.

It is a reasonably user-friendly piece of software, and although a luxury item I can recommend it to anyone who wants easy access to the Electron's functions.

One word of warning before you rush out and buy it – make certain that you can easily read 80 column text on your television or monitor.

Product: Advanced Control Panel  
Price: £34.50  
Supplier: Advanced Computer Products, 6 Avon House, Chobham, Surrey GU24 8LZ  
Tel: 0276 78545

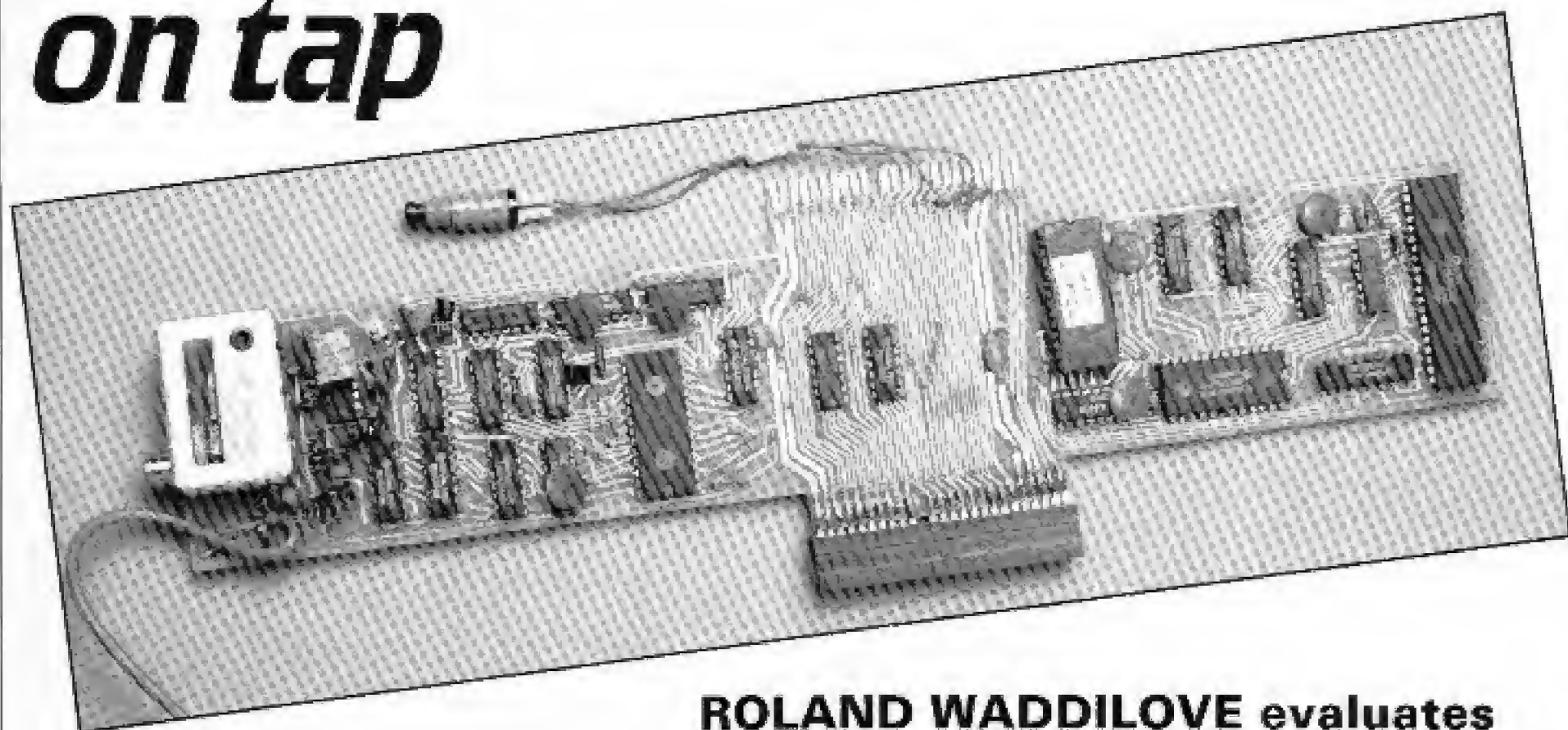


Figure 2: The disc catalogue under ACP control



## Hardware Review

# Teletext on tap



**ROLAND WADDILOVE evaluates  
a Mode 7 adapter for the Electron**

**Product:** Mode 7 Adapter  
**Price:** £89.00  
**Supplier:** Jafa Systems, 9  
Lon-y-Garwa, Caerphilly,  
Mid-Glamorgan  
**Tel:** 0222 887203

**IT has taken nearly four years, but now here at last is a true Mode 7 adapter for the Electron. And very impressive it is too.**

It's a hardware add-on which plugs directly into the back of the Electron and is about the same size as a Plus 1.

The pre-production prototype version I tried was not cased, so I can't say what it will look like when finished. Hopefully, it will match the colour and style of the Electron.

Plus 1, 3 and Rombox owners needn't worry, as the edge connector is continued at the rear of the board and our Rombox Plus and Cumana disc interface worked perfectly throughout the review.

There is a short monitor lead on the left side of the board which is not, as I first thought, for plugging into a monitor, but into the moni-

tor socket on the Electron's side.

The TV output is taken from the Mode 7 adapter itself, not the Electron. There isn't a monitor output, and I hope this slight deficiency is rectified on production models.

There's really very little to it. You simply plug in, switch on, type \*MODE7ON and tap the Break key. You now have Mode 7 in addition to the normal modes 0 to 6.

HIMEM is set at &7C00 so 5k extra ram is available for your programs.

The Electron has a habit of clearing this on pressing Break (it still thinks this is the screen memory) so there's a special reset button which acts like a soft Break. However, the content of the extra ram stays intact.

You can print all teletext characters, colours and graphics on the Mode 7 screen and you can even poke it directly if you wish.

As a test I borrowed half a dozen BBC discs from the *Micro User* team and booted them up on the Electron. They all worked.

In fact, no matter how

they were written – legally or illegally – they produced a perfect display every time.

One of the toughest tests was Invasion from the February 1984 issue of *The Micro User*. This is a Mode 7 version of space invaders.

After adding two lines to stop the introductory music from playing it ran first time. It was every bit as good on the Electron as it is on the BBC Micro.

As a bonus, the adapter also works with Slogger's Turbo (but not 64k shadow ram model), so now you can have the speed of the BBC Micro and Mode 7 as well.

With this combination quite a high proportion of (unprotected) BBC Micro software will run on the Electron.

But you won't be able to run commercial software such as Acornsoft's Revs.

There are many reasons why this won't work. One is simply that the software checks which micro it is running on while loading and will stop if it's an Electron.

You can turn the adapter off at any time so the micro behaves as a normal

Electron.

Several new commands have been added to the Electron's operating system. The Mode 7 display can be brought down the screen with \*TV255 and the BBC Micro's red function keys are emulated on the Electron's keyboard.

On the BBC Micro you can press Shift, Control or Shift+Control and a function key to obtain special effects.

This doesn't work on the Electron, but after \*EFN and Break the bottom three rows of the keyboard emulate these keys when used with Caps Lk/Func.

At £79 the adapter costs as much as an Electron itself and must be considered a luxury rather than a necessity.

Remember, no matter what you add to an Electron, it will never be exactly the same as a BBC Micro, and you could end up paying out more.

However it does carry the Electron a long way down the road towards that great micro, and if money is no object then I can recommend it. ■



## HALL OF FAME

### *The Time Machine (continued) – Chris Lowe*

You should now have INSERTED the prisms and thus have an operational time machine. Six different locations can now be visited via the machine. They are: The Cellar, The Prehistoric Age, The Sphinx, The Mary Celeste, The Grassy Plain and The Vortex.

Ignore the other time machine in The Vortex as it is of no use.

On The Grassy Plain lever the metal plate with the crowbar. Enter the shaft and put a hammer in the works of the generator.

You should now find that the robot won't stop you from entering the archway. This is where you will find Doctor Potter – take him/her to finish the adventure.

### *Rick Hanson – Robert Hales*

From the starting location go W then IN to the telephone box. GET THE RECORDER and PRESS PLAY to receive your instructions. Before the recorder self-destructs THROW it.

Leave the telephone box, go W then N and get the

PORK PIE, then go S and W to Platform 1.

Cross the bridge, go N then E and GET THE SPANNER from the workman's tent. Go back across the bridge and return to the location where you started. Go N and GET THE POLISH. A man in dark glasses will start to follow you. Return to the bridge and WAIT.

Keep waiting until you hear a train approaching. When the carriage containing the loose stone chippings passes beneath you JUMP. Go D and KILL GUARD WITH SPANNER. Go OUT.

From the sidings go D to the staircase, then SE, S, SW, W, NW, N to the outskirts of the village. Go W, W, W and GET THE IMPI.

Then go E, S, W, W, W and GET THE RAZOR. Then go E, N, E, N to reach the village square. Go IN to the church. In the church, go S, S, W and EXAM FRAME.

Make a note of the hymn numbers before going E, S, E into the vestry. Climb the steps to the bell tower and CUT ROPE WITH RAZOR then GET ROPE. Leave the church, go E then IN to the butcher's shop. GET THE HOOK.

## Hampstead Maze

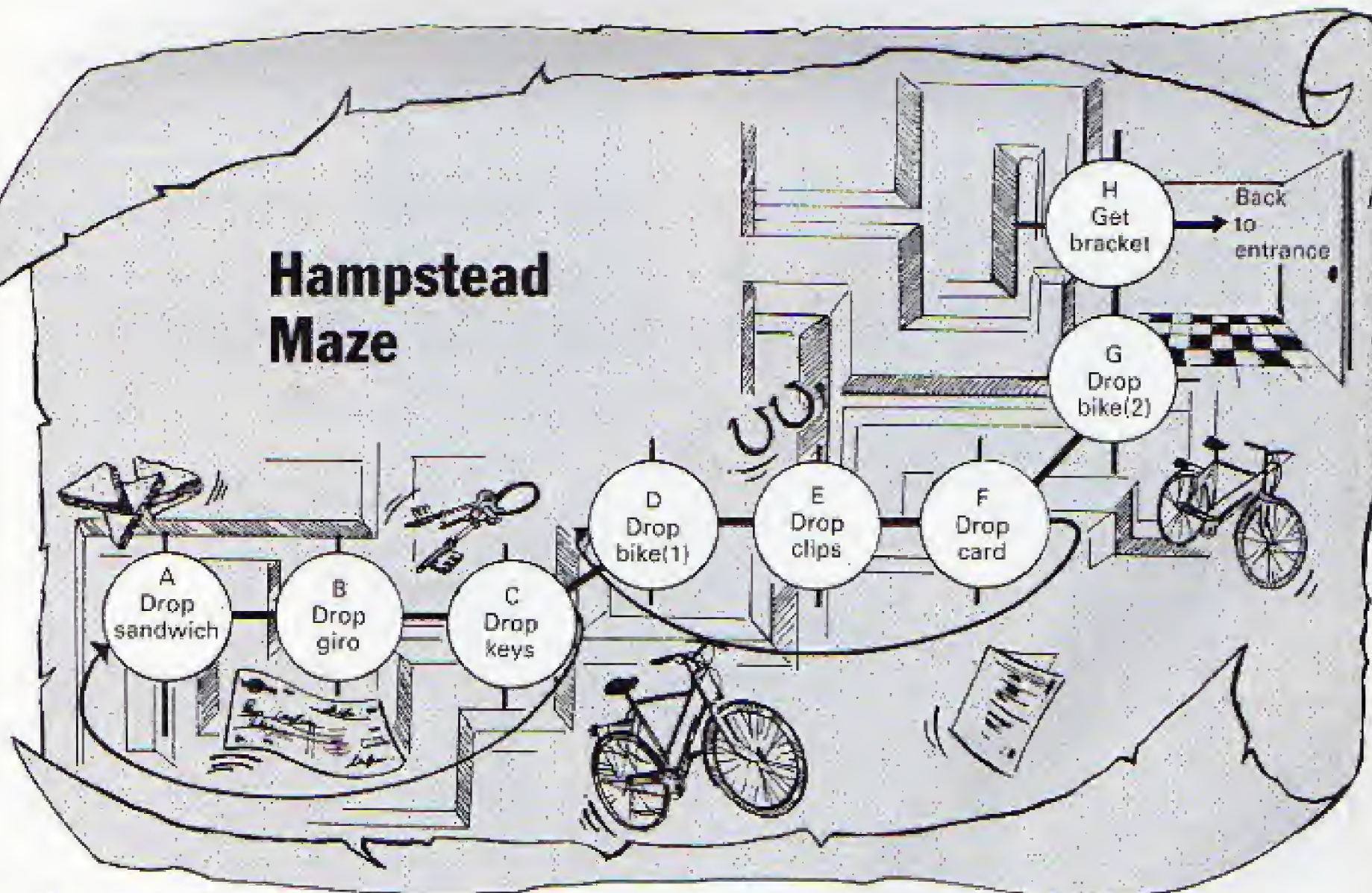


Figure 1: Hampstead Maze

### OVERTURE AND BEGINNERS

There can be nothing so off-putting for the beginner than a complex maze in his first or second sortie into adventureland. As an experienced adventurer, I am often flummoxed by a maze which, on first inspec-

tion, seems unmappable.

But here's some good news – every maze I have met in text adventures on my Electron and BBC Micros, can be mapped using one of the following techniques.

Perhaps the most common type of maze is where each location descrip-

tion appears identical and all the exits seem the same.

This maze can be mapped fairly successfully by the "dropping method".

Providing you are carrying enough artefacts you can drop a different one at each maze location and so alter the descriptions from each other.

The Industrial Estate in Hampstead is a prime example of this type of maze. Before beginning a maze exploration it is vital that you SAVE your position to tape so that if you become lost you can start again at the entrance.

Turn to Page 22 ►



In Hampstead, on entering the maze at A shown in Figure 1, I dropped the cod and banana sandwich and then went NORTH. When a sandwich appeared at my seemingly new location I realised that I hadn't moved. I then tried each exit until I discovered one which didn't lead to the same sandwich.

At C I had a surprise which proved that the maze wasn't totally logical. Moving EAST I found myself back at the sandwich at A! Retracing my steps I dropped the keys at C before discovering a new location NORTH EAST at D, which was mapped as before.

provided a second surprise as travelling NORTH took me back to the entrance. My first thought was that surely the maze cannot be so simple and anyway what is the point of it? I went back to the bicycle clips which I had dropped at E and soon discovered another exit to the EAST.

remembered that I had been arrested for indecent exposure earlier in the game and decided on a new course of action.

Thankfully, soon afterwards I discovered a valuable treasure NORTH of G — a lathe retaining bracket!

I have used this particular technique in many adventures. The mazes in *Sphinx* and *Classic* spring instantly to mind as occasions where this method was successful.

A stylized, high-contrast illustration of a city street scene. In the foreground, a large, tangled mass of keys is prominently displayed, featuring various key shapes and a thick, coiled chain. The background shows a street lined with buildings, rendered in a simplified, graphic style with dark silhouettes and white highlights. The overall aesthetic is reminiscent of mid-20th-century graphic design or a stylized photograph.

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Sphere of Destiny	7.95	6.75	Magic Story Maker	9.95	7.50	Night Strike		1.99
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**DATABASE PUBLICATIONS**



To order  
please turn  
to the form  
on Page 53




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# The big squeeze

## Mark Smiddy shows how to cram up to 200 Mode 2 screens on one disc

FROM the very start of computing to just a few years ago most adventure games available for computers were of the text only variety.

This was because most of the early computers were incapable of graphics of any kind. These days anything worth calling itself a computer, whether micro or mainframe, has to have graphic capabilities.

No matter which computer you refer to, graphics eat large amounts of memory. The better the graphics the larger the amount of memory they require.

Never has this been truer than in the case of our very own and much beloved, if sometimes misunderstood Acorn Electron. Its higher resolution graphics modes gobble up 20k of the available memory, leaving only 8k or so free for Basic.

While this might be fine for a machine code programmer composing his ultimate arcade masterpiece, to the writer of adventure games this is very limiting. Adventure games, by their very nature, need as much memory as possible.

The obvious alternative is

to resort to pure text, leaving the Electron programmer approximately 20k free in Mode 6. The best text adventures are reckoned to need no graphics, as the mind conjures images with which no affordable computer could ever compete. At least that's what the writers tell us.

It is here that we encounter the catch 22 situation. If we use graphics we won't have any memory. If we use text we'll have to write like Shakespeare.

The solution is to store

```
10 REM Program I
20 MODE 2
30 *SPOOL Picture
40 FOR N=1 TO 10
50 GCOL 3,RND(15)
60 PLOT 85,RND(1280),RND
(1024)
70 NEXT
80 *SPOOL
```

Program I

drawings for your masterpiece in a very compact form, preferably on disc, but how?

Program I illustrates an interesting feature of the Electron of which not many people are aware, in the form of the \*SPOOL command.

In the manual we are told that \*SPOOL sends copies

of all characters sent to the screen to the currently selected filing system. Disc in this case, although tape will work just as well.

\*SPOOL is generally used to create Ascii files for merging with other programs or loading into word processors such as View. Because it sends all vdu codes to the disc, including PLOTs, DRAWs and so on, by \*EXECing the file back in we can redraw any picture.

This method is fast and extremely compact and very complex pictures can be stored in only a few hundred bytes.

When Program I is run it changes to Mode 2, opens file called Picture and draws some random triangles. The total length of the demonstration file created is a mere 90 bytes. To recreate the picture on the screen type.

```
MODE 2
*EXEC Picture
```

The Electron then redraws the original picture. Now insert the following:

```
65 TIME=0:REPEAT UNTIL
TIME>=200
```

and re-run Program I. The delay loop at line 65 simulates calculation; of some

complex 3D image perhaps. Once the file has been created all that has to be done is to redraw it on the screen. Type:

```
*EXEC Picture
```

and press Return. This takes very little time at all, since all of the slow calculations have already been done.

There are however, other ways of executing this since it is just an Ascii file. Programs II and III illustrate this, although we are still fixed to a limit of 31 filenames, which means a limit of 31 pictures on a disc filing system disc.

```
10 REM Program II
20 X=OPENUP "Picture"
30 REPEAT
40 VDU 8GET#X
50 UNTIL EOF#X
60 CLOSE #X
```

Program II

```
10 REM Program III
20 MODE 2
30 *LOAD Picture 2000
40 FOR NX=0 TO 91
50 VDU NX#82C00
60 NEXT
```

Program III

So where do you go from here? The obvious solution is to store all the pictures under one filename. This is very efficient and it stops



You are inside a wooden cabin.  
South you can see a road.  
There is an empty stone jug here.  
There is a brass key here.  
There is an unlit oil lamp here.





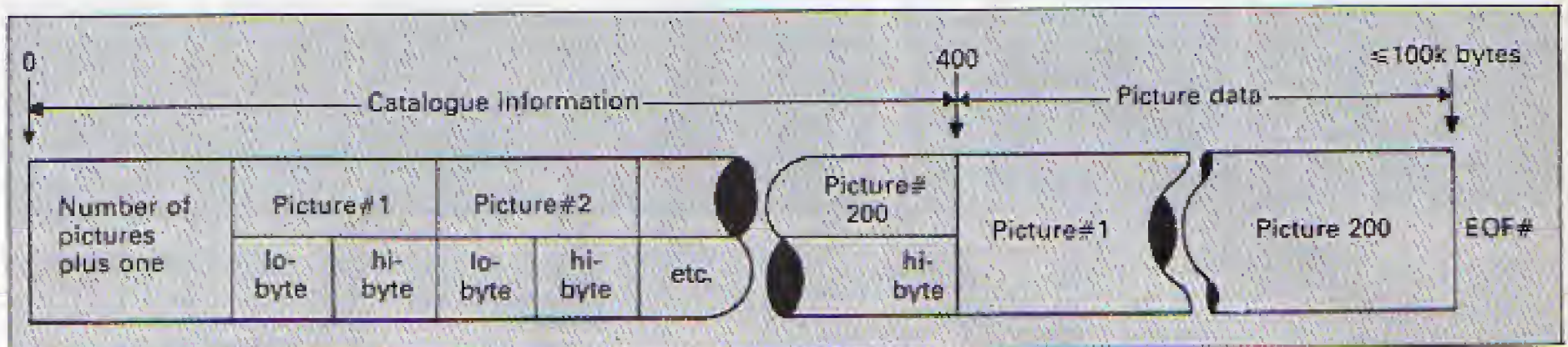


Figure 1: The disc file structure

everyone peeking at your pictures. The technique is not as difficult as it might first seem.

All you have to do is create a file large enough to hold all the information.

Essentially this involves

```
10 REM Program IV
20 INPUT "Name of master
file?"master$
30 INPUT "Length of file
in bytes?"L$
40 X=OPENUP master$
50 BPUT #X,0:BPUT #X,145
:BPUT #X,1
60 FOR N=3 TO 400
70 BPUT #X,0
80 NEXT
90 FOR N=0 TO L$ STEP 4
100 PRINT#X,0
110 NEXT
120 CLOSE #X
```

Program IV

```
10 REM Program V
20 DIM S2 5000
30 INPUT "Name of master
file?"master$
40 REPEAT
50 INPUT "Name of picture
to store?"filename$
60 X=OPENUP filename$
70 count1=EXT#X-1
80 FOR N=0 TO count1
90 S2=N:BGET#X
100 NEXT
110 CLOSE #X
120 Y=OPENUP master$
130 total1=BGET#X
140 total1=total1+1
150 PTR#X=0
160 BPUT#X,total1
170 PTR#X=(total1-1)*2+1
180 PTR#X=(BGET#X+BGET#X*
256)
190 FOR N1=0 TO count1
200 BPUT#X,S2#N1
210 NEXT
220 B1=PTR#X
230 PTR#X=total1*2+1
240 BPUT#X,B1 MOD 256
250 BPUT#X,B1 DIV 256
260 CLOSE#X
270 PRINT "Again?(Y/N)"
280 UNTIL INSTR("Nn",GET$)
```

Program V

writing a very crude disc filing system in Basic. Programs IV and V do this. While most of this does not directly apply to the advanced disc filing system, it can be used since the system will work equally well on either.

Program IV saves space on the disc for a master file. This will be used to store graphic screens. You are first asked for the name of your master file. I suggest that you call it Pics, or something similar to keep things easy. You will then be asked how long the file is going to be in bytes - 70k should be enough for most applications.

The program creates its own separate catalogue 401 bytes long and a blank space on the disc to the size you have input.

Figure 1 illustrates the structure of this master file. The first byte of the file is the number of pictures stored on the disc plus one. There is space in the catalogue for 200, enough for most applications.

Following that are 400 bytes organised as 200, 2 byte pairs, low byte first, each one pointing to the start position within the file of each successive picture.

The last non zero pair always point to the end of the last concatenated file. From position 401 onwards is the data for the pictures themselves. If all that is starting to make your brain itch, don't worry, you don't have to understand how the system works to use it.

Program V, does most of the hard work. Initially you will be prompted for the name of your master file, this is the name of the file

that was created by Program IV.

You will then be asked for the filename of a picture to store - the name of a picture that you have \*SPOOLED to disc. Use the one you created in Program I. This will be copied and stored in the

```
10 REM Program VI
20 MODE 6
30 INPUT "Name of master
file?"master$
40 X=OPENUP master$
50 REPEAT MODE 2
60 INPUT "Picture number
?"PX
70 total1=BGET#X
80 IF PX>total1-1 PRINT
"Out of Range!":CLOSE#X:END
90 PTR#X=PX*2+1
100 start1=(BGET#X+BGET#X
*256)
110 endX=(BGET#X+BGET#X*2
56)
120 PTR#X=start1
130 FOR N=start1 TO endX-
1
140 A1=BGET#X:CALL&PFES
150 NEXT
160 PRINT "Again?(Y/N)"
170 UNTIL INSTR("Nn",GET$)
180 CLOSE #X
```

Program VI

master file and you can delete the original.

After putting all of your masterpieces into one file you can then use Program VI to look at them.

The surprising thing about this technique is that it works equally well for text SPOOLED from a word processor such as View or Starword. This means that you could create a separate file containing the descriptions of all of your locations and simply pluck each one from disc as it is required.

While this is inevitably slower than straightforward printing, it removes the bother of having to write an on screen formatter or pad

out your text with extra spaces.

Program VII is just one example of how it is possible to create a single file containing up to 200 room descriptions from a word processor file. The program recognises the start and end of each description by the presence of the hash '#' character, therefore this must be present at the start and end of the file itself.

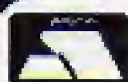
```
10 REM Program VII
20 DIM pointer1(200)
21 PX=0
30 INPUT "Name of master
file?"master$
40 INPUT "Name of descri
ption file?"filename$
50 X=OPENUP filename$
60 Y=OPENUP master$
70 count1=EXT#X-1
71 PTR#Y=401
80 FOR N1=0 TO count1
90 B1=BGET#X
100 IF B1=ASC("#") pointer1
(PX)=PTR#Y:PTR#Y=PTR#Y+1 ELSE BPU
T#Y,B1
110 IF PX>201 PRINT "Too n
any!":CLOSE#X:END
120 NEXT
130 CLOSE#X
131 PTR#Y=0
132 BPUT#Y,PX-1
140 FOR N1=0 TO PX
150 BPUT#Y,pointer1(N1) *
00 256
160 BPUT#Y,pointer1(N1) 0
170 NEXT
180 CLOSE#Y
190 PRINT PX-2;" descript
ions found."
```

Program VII

The advantage of both of these systems is that they use very little memory, apart from a simple load from disc to screen routine.

The rest of the program can be dedicated to the control of the game. This in the end will be the deciding factor as to whether or not the game is any good ■





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WHEN the crunch finally comes a micro is little more than a very smart adding machine.

It is however, so sophisticated that simple pocket calculator arithmetic can become quite difficult. That's why the following calculator program was devised.

To operate it move the pointer, using the cursor keys to the button that you want and press Return to push it.

Following in the tradition of the early portables, the display can only hold numbers in the range  $1E-7 < X < 99999999$  before an error message is generated.

Although this range is more than adequate for most normal calls, that is non-scientific calculation.

The calculator has a total of seven functions and a memory. The four main operands  $^*$ ,  $/$ ,  $+$  and  $-$  work as normal and in correct sequence, that is  $2+3*4$  produces 14 and not 20.

Similarly the square and square root functions act on the number on the display not on the whole calculation.

To enter a number into the calculator's memory press the M+ button once. The letter 'm' appears at the right of the display to remind you that the

# It's the number cruncher!

**CARL DUNKLEY turns your Electron into a pocket calculator**

memory is in use.

Each time the M+ button is pressed the number in the display will be added to the number in the memory.

The M- button works in the same way only it subtracts the number in the display from the number in the memory. The memory is cleared by pressing the Mc button and recalled by pressing M.

If you make a mistake while entering a calculation

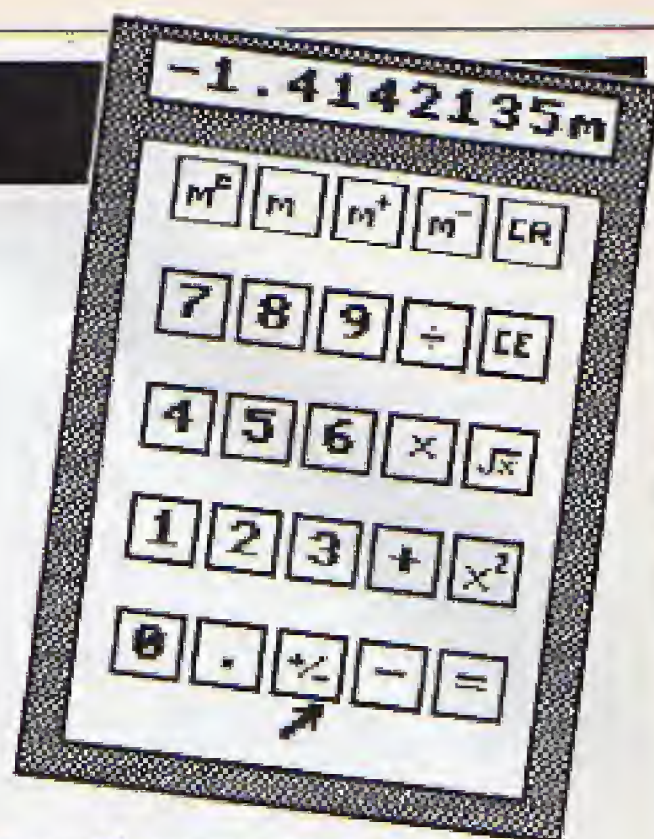
the last input can be cleared with the CE (clear entry) button.

If you press the wrong operator, for instance, plus instead of minus press the correct operator before entering anything else.

In the event of an error, for example a range error or

division by zero, the screen displays the message ERROR. This can only be cleared by pressing the CR (clear all) button.

Incidentally, owners of the Plus 1 interface don't have to use the keyboard at all, since the program is fully compatible with joysticks.



## VARIABLES

X% X Position of pointer.  
Y% Y Position of pointer.  
button% True when Return pressed.

## PROCEDURES

clear Clears the display.  
equal Completes all pending operations.  
maths Handles the  $^*/+-$ .  
memory Controls all memory functions.  
pointer Draws the pointer.  
screen Draws the screen.

## CONTROLS

Cursor up = Move pointer up.  
Cursor down = Move pointer down.  
Cursor left = Move pointer left.  
Cursor right = Move pointer right.  
Return = Press button.

```
10 REM CALCULATOR
20 REM By: C.Dunkley
30 REM (c) Electron User
40 MODE4:PROCcharacters
50 PROCscreen:PROCinitialis
60 REPEAT:PROCmove
70 IFbutton% PROCcontrol
80 PROCprt
90 UNTIL0
100 END
110 DEFPROCmove
120 C=X%:D=Y%
130 L=ADVAL(1)DIV256
140 U=ADVAL(2)DIV256
150 IFL=0ANDU=0 L=125:U=125
160 K=INKEY%
170 C=C-2*(L=0 ORK=137)+2*(L
=255 ORK=136)
180 D=D-3*(U=0 ORK=138)+3*(U
=255 ORK=139)
190 IFK=13 ORADVAL(0)AND3 SO
```

```
UND1,-10,2,3:button%=-1 ELSE b
utton%=-0
200 REPEAT J%X=ADVAL(0)AND3:
UNTILJ%X=0
210 IFE=X% ANDD=Y% ENDPROC
220 IFD<15 ORD>27 ENDPROC
230 IFC<10 ORC>25 ENDPROC
240 PROCpointer(X%,Y%)
250 PROCpointer(C,D)
260 X%=C:Y%=D
270 ENDPROC
280 DEFPROCcontrol
290 X=XDIV2-7:Y=10-YDIV3
300 IFY=5 ANDX<5 PROCmemory:
ENDPROC
310 IF(Y=4 ANDX<4) OR(Y=3 AN
DX<4)OR(Y=2 ANDX<4) OR(Y=1 AN
X=1) PROCnumber:ENDPROC
320 IF(Y=5 ANDX=5) OR(Y=4 AN
DX=5) PROCclear:ENDPROC
330 PROCfunction
340 ENDPROC
```

```
350 DEFPROCclear
360 IFY=5 ANDX=5 calc%=-
370 scrn%=-neg%:dot%=-0
380 last_key%=-0:PROCprt
390 ENDPROC
400 DEFPROCnumber
410 last_key%=-0:L=LENscrn%
420 IFdot% L=L-1
430 IFneg% L=L-1
440 IFL>8 ENDPROC
450 chr%=CHR$(X-((Y=1)*47+(Y
=2)*48+(Y=3)*51+(Y=4)*54))
460 IFscrn%="0" ANDchr%="0"
ENDPROC
470 IFscrn%="-0" ANDchr%="0"
ENDPROC
480 IFscrn%="-0"ORscrn%="0's
crn%="
490 scrn%=scrn%+chr%:PROCprt
500 ENDPROC
510 DEFPROCmemory
520 last_key%=-0
```

```
530 IFX=1 memory%=-:neneg%
=0:memdot%=-0:PROCprt:ENDPROC
540 IFX=2 scrn%=memory%:PROC
prt:neg%=neneg%:dot%=memdot%:
ENDPROC
550 IFX=3 dummy%=STR$(VALmem
ory$+VALscrn%)
560 IFX=4 dummy%=STR$(VALmem
ory%-VALscrn%)
570 PROCcheck(dummy%)
580 IFe% PROCerror:ENDPROC
590 neneg%=n%:memdot%=0%
600 memory%=dummy%:PROCprt
610 PROCcheck2
620 ENDPROC
630 DEFPROCfunction
640 IFX=2 ANDY=1 PROCdot:END
PROC
650 IFX=3 ANDY=1 PROCneg:END
PROC
660 IFX=5 ANDY=1 PROCequal:E
```

Turn to Page 30 ▶



## From Page 29

```

NOPROC
670 IFX=5 ANDY=2 PROCeqn:END
PROC
680 IFX=5 ANDY=3 PROCroot:END
PROC
690 PROCmaths
700 ENDPROC
710 DEFPROCdot
720 IFdotX ENDPROC
730 dotX=-1: last_keyX=0
740 IFscrnS="scrnS":PR
Cprt:ENDPROC
750 scrnS=scrnS+":PRCprt
760 ENDPROC
770 DEFPROCneg
780 last_keyX=0
790 IFnegX negX=0:scrnS=RIGH
T3(scrnS,LENScrnS-1):PRCprt:E
NOPROC
800 IFscrnS="scrnS":B:ELS
EscrnS="":scrnS
810 negX=-1:PRCprt
820 negX=-1:PROCcheck2:neg=0
830 ENDPROC
840 DEFPROCscr
850 last_keyX=0
860 dummyS=STR$(VALscrnS)^2
)
870 PROCcheck(dummyS)
880 IFex PROCerror:ENDPROC
890 scrnS=dummyS
900 negX=nX:dotX=dX
910 PROCprt:PROCcheck2
920 ENDPROC
930 DEFPROCroot
940 IFnegX PROCerror:ENDPROC
950 last_keyX=0
960 dummyS=STR$(SQR(VALscrnS
))
970 PROCcheck(dummyS)
980 IFex PROCerror:ENDPROC
990 scrnS=dummyS
1000 negX=nX:dotX=dX
1010 PROCprt:PROCcheck2
1020 ENDPROC
1030 DEFPROCequal
1040 last_keyX=0
1050 IFscrnS="scrnS":B
1060 as=LEFT$(calcS,1)
1070 IFas="ORas":calcS=B
+calcS
1080 IFRIGHT$(calcS,1)="/"AND
ABS(VALscrnS)=0 PROCerror:END
PROC
1090 calcS=calcS+scrnS:ex=0
1100 FORN=1TOLENCalcS
1110 IFMID$(calcS,N,1)="/"PR
OCdivision(N+1)
1120 NEXT
1130 IFex PROCerror:ENDPROC
1140 dummyS=STR$(EVAL(calcS))
1150 PROCcheck(dummyS)
1160 calcS=""
1170 IFex PROCerror:ENDPROC
1180 scrnS=dummyS
1190 negX=nX:dotX=dX
1200 PROCprt
1210 PROCcheck2
1220 ENDPROC
1230 DEFPROCdivision(count)
1240 as=""
1250 IFMID$(calcS,count,1)="/"
as="":count=count+1
1260 REPEAT
1270 bs=MID$(calcS,count,1)
1280 IFINSTR("/+-",bs)=0 as=

```

```

a$+bs:count=count+1
1290 UNTILINSTR("/+-",bs)=0
ORcount=LENCalcS
1300 IFABS VALas=0:ex=-1
1310 ENDPROC
1320 DEFPROCcheck2
1330 REPEAT:PROCmove
1340 Y=10-Y:XDIV3:X=XDIV2-7
1350 IF(Y=5 ANDX<5) ANDbutton
X buttonX=0:PROCmemory
1360 IFY=1 ANDX=3 ANDbuttonX
buttonX=0:PROCneg
1370 UNTILbuttonX
1380 IFY=1 ANDX=2 AND neg PRO
Cdot:ENDPROC
1390 IFY=1 ANDX=2 scrnS="0":
dotX=-1:negX=0:last_keyX=0:PR
Cprt:ENDPROC
1400 IFY=4 ANDX<4 ORY=3 ANDX<
4 ORY=2 ANDX<4 ORY=1 ANDX=1 sc
rnS="":dotX=0:negX=0:last_keyX
=0:PROCnumber:ENDPROC
1410 PROCfunction
1420 ENDPROC
1430 DEFPROCmaths
1440 IFlast_keyX PROCtrue:END
PROC
1450 calcS=calcS+scrnS
1460 PROCoperation
1470 last_keyX=-1
1480 negX=0:dotX=0

```

This is one of hundreds of  
programs now available  
FREE for downloading on  
**MicroLink**

```

1490 PROCprt:PROCcheck2
1500 ENDPROC
1510 DEFPROCtrue
1520 calcS=LEFT$(calcS,LENCa
cS-1)
1530 PROCoperation
1540 ENDPROC
1550 DEFPROCoperation
1560 IFY=4 calcS=calcS+"/"
1570 IFY=3 calcS=calcS+"*"
1580 IFY=2 calcS=calcS+"+"
1590 IFY=1 calcS=calcS+"-"
1600 ENDPROC
1610 DEFPROCcheck(ds)
1620 nX=0:dX=0:ex=0
1630 IFDS="0"ORDS="" ENDPROC
1640 IFABS(VALDS)>99999999 OR
ABS(VALDS)<1E-7 ex=-1:ENDPROC
1650 count=1:num=1:dummyS=""
1660 REPEAT
1670 as=MID$(DS,count,1)
1680 count=count+1
1690 dummyS=dummyS+as
1700 IFas<>"ANDas<>" num=
num+1
1710 UNTILnum=9
1720 i=INSTR(0S,"E")
1730 IFi<>0 ANDINSTR(dummyS,"
E")=0 dummyS=dummyS+RIGHT$(DS,
i)
1740 DS=dummyS:IFI<>0 PROCexp
1750 IFLEFT$(DS,1)="-":nX=-1
1760 IFINSTR(0S,".")<>0dX=-1
1770 count=1:num=0:dummyS=""
1780 REPEAT
1790 as=MID$(DS,count,1)
1800 count=count+1

```

```

1810 IFas<>"ANDas<>"ANDas
<>" num=num+1
1820 dummyS=dummyS+as
1830 UNTILnum=8 ORas=""
1840 count=LENDummyS
1850 IFNOTdX ENDPROC
1860 REPEAT
1870 as=MID$(DS,count,1)
1880 IFas="0":count=count-1
1890 UNTILas<>"0"
1900 dummyS=LEFT$(dummyS,coun
t)
1910 ENDPROC
1920 DEFPROCexp
1930 nS=""
1940 zero=VAL MID$(DS,LENDs,1
)
1950 IFLEFT$(DS,1)="-":nS="-"
DS=RIGHT$(DS,LENDs-1)
1960 DS=LEFT$(DS,LENDs-3)
1970 DS=RIGHT$(00000000,zero
)+DS
1980 d=INSTR(DS,".")
1990 IFd=0DS=DS+":d=LENDs
2000 DS=LEFT$(DS,d-1)+MID$(DS
,d+1,LENDs)
2010 d=d-zero-1
2020 DS=nS+LEFT$(DS,d)+":"+M1
D$(DS,d+1,LENDs)
2030 ENDPROC
2040 DEFPROCerror
2050 PRINTTAB(15,10);SPC(5);
ERROR
2060 REPEAT:REPEAT:PROCmove
2070 UNTILbuttonX
2080 X=XDIV2-7:Y=10-Y:XDIV3
2090 UNTILX=5ANDY=5
2100 dotX=0:scrnS="":calcS=""
:negX=0:last_keyX=0
2110 ENDPROC
2120 DEFPROCprt
2130 IFABSVALmemoryS=0 memory
S=""
2140 IFmemoryS<>"PRINTTAB(25
,10);" ELSEPRINTTAB(25,10);"
2150 PRINTTAB(15,10);
2160 IFscrnS="PRINTSPC(9)"B
:ENDPROC
2170 PRINTSPC(10-LENScrnS)scr
nS
2180 ENDPROC
2190 DEFPROCpointer(A,B)
2200 GCOL3,1
2210 MOVEA+32,(32-B)*32+12
2220 VDU23,236,4
2230 ENDPROC
2240 DEFPROCinitialise
2250 X2=16:Y2=27
2260 PROCpointer(X2,Y2)
2270 memoryS="":scrnS="":calc
S="":negX=0:last_keyX=0:dotX=0
:menegX=0:mendotX=0:neg=0
2280 ENDPROC
2290 DEFPROCcharacters
2300 *fx4 1
2310 *fx11
2320 VDU23,8202,0,0,0;
2330 VDU23,224,0,822,814,8,81
4,822,0;
2340 VDU23,225,0,16,0,870,0,1
6,0
2350 VDU23,226,0,842,8E4,848,
16,827,0
2360 VDU23,227,0,83F,820,82A,
824,8AA,840
2370 VDU23,228,3,1,2,88B,830,
820,850,888

```

```

2380 VDU23,229,0,8EE,888,80C,
888,8EE,0;
2390 VDU23,230,0,8EE,889,89F,
88A,8E9,0;
2400 VDU23,231,7,4,7,808,8A8,
8A8,888,0
2410 VDU23,232,0,0,808,8A8,8A
8,888,0
2420 VDU23,233,0,7,0,808,8A8,
8A8,888,0
2430 VDU23,234,2,7,2,808,8A8,
8A8,888,0
2440 VDU23,235,0,255,0,0,255,
0,0,255
2450 VDU23,236,7,63,15,30,50,
114,224,192
2460 ENDPROC
2470 DEFPROCscreen
2480 ?8358=85:CLS:8358=0
2490 COLOUR129:COLOUR0
2500 VDU24,28,28,1252,1000;
2510 CLG:MOVE32,998:DRAW1246,
998:VDU28,1,30,30,1:CLS
2520 PRINT;STRING$(9,CHR$(235)
;"Electron Calculator";STRING
$(9,CHR$(235));
2530 VDU26:GCOL0,0:GCOL0,129
2540 FORY=1TO5:FORX=1TO5
2550 READchr
2560 AX=13+X*2:B=10+Y*3
2570 PROCwindow(AX,BX,1)
2580 PRINTTAB(AX+1,BX)CHR$(chr
)
2590 NEXT:NEXT
2600 PROCwindow(14,10,11)
2610 PROCsquare(13,28,33,20)
2620 PROCsquare(14,27,11,16)
2630 PROCfill(452,900,170,-1)
2640 PROCfill(452,574,170,-1)
2650 PROCfill(452,470,170,-1)
2660 PROCfill(452,684,170,-1)
2670 ENDPROC
2680 DEFPROCwindow(A,B,L)
2690 A=A+32+32:B=(31-B)+32
2700 MOVEA-10,B-10:DRAWA+L+32
+10,B-10:DRAWA+L+32+10,B+42:DR
AWA-10,B+42:DRAWA-10,B-10
2710 DRAWA+L+32+10,B-10
2720 DRAWA+L+32+10,B+42
2730 DRAWA-10,B+42
2740 DRAWA-10,B-10
2750 ENDPROC
2760 DEFPROCsquare(A,B,L,D)
2770 A=A+32+32:B=(31-B)+32
2780 MOVEA-10,B-10
2790 DRAWA+L+32+4,B-10
2800 DRAWA+L+32+4,B-10+32
2810 DRAWA-10,B-10+32
2820 DRAWA-10,B-10
2830 ENDPROC
2840 DEFPROCfill(A,B,G,E)
2850 FORL=-4TO4STEP8
2860 BX=B+8339:G:REPEAT
2870 PLOT77,A,BX:B=BX+L
2880 IF ?8359=8339 EOR255
2890 UNTILPOINT(A,BX)=0
2900 NEXT:8359=0
2910 ENDPROC
2920 DATA231,232,234,233,230
2930 DATA55,56,57,225,229
2940 DATA52,53,54,224,227
2950 DATA49,50,51,43,228
2960 DATA48,46,226,45,61

```

This listing is included in  
this month's cassette  
tape offer. See order  
form on Page 53.



# Woolball

10  
LINERS



THIS month's 10 liner, written by 10-year-old Joe Hardwicke, is a tie-in to our knitting software offer. This unusual but clever little graphics routine plots lines randomly between the points of a circle and ends up with a criss cross pattern that's not dissimilar to a ball of wool.

Three balls are drawn, each on top of the last, ending with a pattern like a ball of wool after the cat has finished playing with it. To make the balls more or less dense alter the FOR variable in line 6.

```
1 MODE 2
2 FORR=200 TO 500 STEP 100
3 GCOLB,RND(7)
4 A=50
5 MOVE 640+R*SIN(A),512
  +R*COS(A)
6 FORJ=1 TO 50
7 A=A+RND(50)
8 DRAW 640+R*SIN(A),512
  +R*COS(A)
9 SOUND 1,-15,J*5,1
10 NEXT J:NEXT INPUT A:GOT
  O 1
```

# Pyramid

IT isn't often that *Electron User* publishes adventure games, but this 10 liner by Gary White is so addictive that we felt we had to. The object is to survive as long as possible in the uncharted wilderness of desert around the pyramid.

On your travels you may find gold, magic potions or meet with one of the many guards that patrol the pyramid.

Potions increase your strength and gold increases your wealth. To pick up objects or carry on just

press the space bar.

On meeting a guard you are automatically challenged to fight or bribe him. Press F to fight or B to bribe. If you intend to bribe a guard you must have enough gold to do so. If not the guard replies NOT ENOUGH and you will have to fight him. Fighting reduces your strength, but provided you are strong enough you'll win in the end.

The longest we have lasted is 33 days. Can you do better?



```
1 MODE 1:VDU 19,3,6;0;:C
  OLOUR 131:CLS:COLOUR 0:VDU 23,
  225,48,36,39,126,252,72,72,
  72:PRINT TAB(29,11);CHR$(225);
  CHR$(225)
```

```
2 VDU 28,0,31,39,12:COL
  OUR 130:CLS:GCOLB,0:MOVED,0:
  MOVE 1279,0:PLOT 85,600,800:G
  COLB,1:MOVE 20,0:MOVE 1259,0:
  PLOT 85,600,780:VDU 28,12,30,
```

```
26,22:COLOUR 0:COLOUR 129:S=5
  00:T=0:TU=1
```

```
3 PRINT "DAY NUMBER ";T
  U:PRINT "GOLD ";T:PRINT "STRE
  NGTH ";S:IF S<=0 THEN GOTO 1
  0 ELSE PRINT "YOU'VE FOUND
  .":X=INT(RND(75)):H=RND(3):
```

```
4 GOSUB H+5
  5 S=S-10:CLS:TU=TU+1:G
  OTO 3
```

```
6 INPUT "A GUARD F or B
  ";I$:IF I$<>"F" AND I$<>"B"
  OR I$="B" AND T<X THEN PRI
  NT "NOT ENOUGH":GOTO 6 ELSE
  IF I$="F" THEN S=S-X:CLS:RE
  TURN ELSE IF I$="B" THEN T=
  T-X:CLS:RETURN
```

```
7 PRINT "A MAGIC POTIO
  N":S=S+X:GOSUB 9:RETURN
  8 PRINT "X" oz. OF GO
```

```
LD:T=T+X:GOSUB 9:RETURN
  9 REPEAT UNTIL GET$=""
  ":RETURN
  10 CLS:PRINT "YOU'RE DEA
  D BUT YOU LASTED ";TU;" DAY
  S AND FOUND ";T;" OUNCES OF
  GOLD":END
```



# DEMONIC DATABASES

**Part I of a new series  
by Bill Trevelyan showing  
how to write text adventures**

**PROGRAMMING** is a means to an end, but if you like puzzle solving it becomes an absorbing pastime.

When I first thought of writing an adventure for my grandson, I decided to test my Basic and machine code programming skills, rather than rely on a commercial adventure writer, good as they may be.

How often have you sat facing a screen on which appears something like the following:

You are in a dank, mouldering cellar lit by a guttering candle. On the peeling plaster of one wall an uncertain hand has traced the words, 'Susie \$873'. The door is half open, but across the gap lies a cheetah, asleep. It looks suspiciously well fed.

This immortal piece of prose is a location or room description. In a text only adventure game there may be a hundred or more words forming what is essentially the landscape.

Pictures are not necessary and some would say that the best adventures have vivid text descriptions that send shivers down your spine.

An adventure game is essentially just a very smart database. Location descriptions and other responses are plucked from the computer's memory and displayed in response to a command entered at the keyboard by the player, and in accordance with a selection of rules devised by the programmer.

This part of the program is analogous to a language such as Basic, and may be called the interpreter, command parser or

operating system.

The player causes a location description to be replaced by another by entering a command such as NORTH or DOWN, which he interprets as moving from one place to another.

When he arrives at the final scene he is told he has saved civilisation, or scored 500 points, or whatever.

The fascination of the game depends largely on how well the descriptions are written.

There are also other pieces of text usually much shorter which we shall simply call messages. For instance:

You can't do that!

The sword shatters in your hand leaving you grasping the hilt.

The book is closed with a gilt lock.

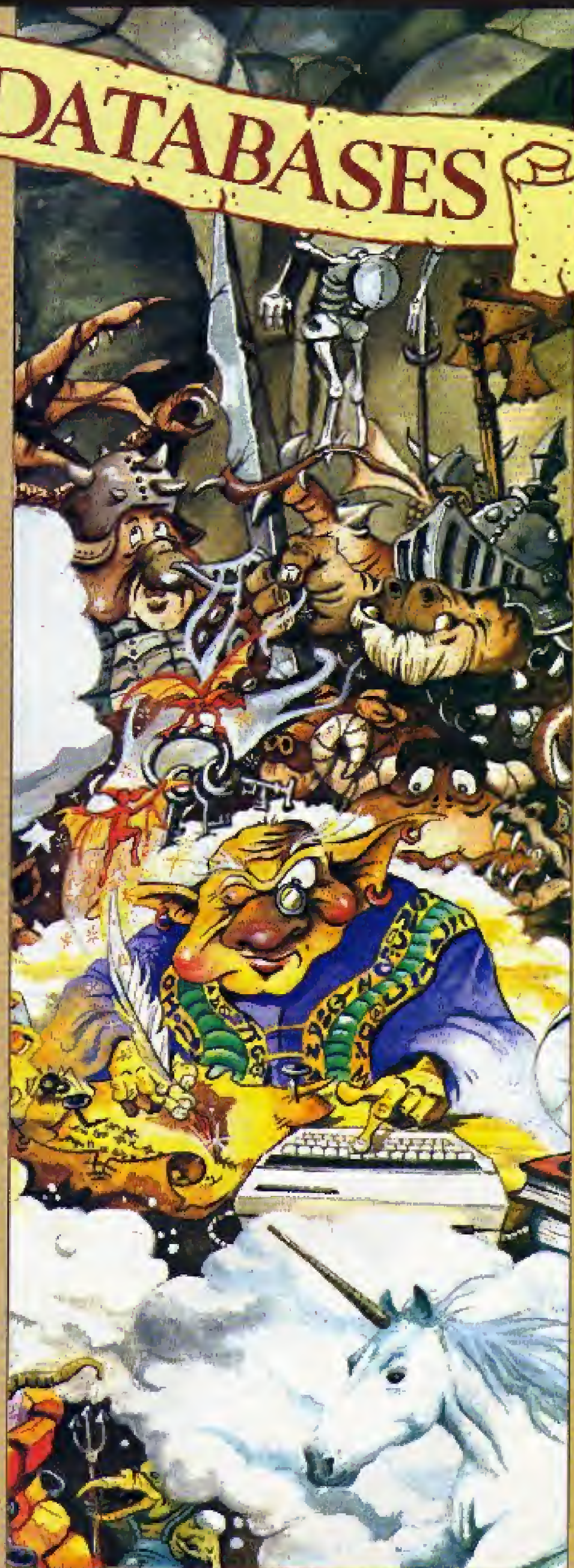
When you are composing a game, how do you store all this text, and how do you call forth the appropriate piece to be displayed on the screen?

I'm not going to try to tell you what to write and assume you are programming in Basic. Even if you settle later for machine code, it's easier if you have sorted out the problems in Basic first.

The simplest way is to write the location descriptions and messages in the form of data statements.

It is better to make them into two separate lists, since the serial number identifying a piece of text can be kept below 255.

That's the largest number which can be stored in a single byte, a convenience appreciated in machine





code programming.

Conversely, if the line numbers of the data statements can be calculated from the number of the location description or message, a simple procedure for printing the required piece of text is sufficient. This technique is shown in Program I:

```
10 REM Program I
20 INPUT "Enter location number: ";numberX
30 IF numberX<1 OR numberX>5 THEN VDU7:GOTO 20
40 TIME=0
50 PROC loc(numberX)
60 PRINT "Time taken was ";TIME;" sec"
70 END
80 DEFPROC loc(nX)
90 RESTORE (5000+nX)
100 READ loc$
110 PRINT loc$
120 ENDPROC
130 END
5000 REM Location Descriptions:
5001 DATA "You are in an octagonal room bathed in a shadow-free radiance by concealed lighting. Masterpieces of modern art line the walls. Archways lead off to E and W. N is a close-fitting door. An ornate chair is nearby."
5002 DATA "You are walking along a white, dusty road which runs north to south"
5003 DATA "The road bends east here. West is a gate leading to a tangled wood."
5004 DATA "The road widens and the marks of tracked vehicles can be seen on the verges."
5005 DATA "You push through some entangling holly bushes to find a large clearing in which stands a low building."
```

Program I

Note that in the final version anything going into the interpreter would be shortened by eliminating non-essential spaces and replacing long variable names with single letters.

Look at the text of location one in line 5001. You will see that extra spaces have been inserted to improve the screen display so that words are not sliced in half.

The description contains 223 characters and the whole data statement consumes 241 bytes. You can't

expand the text to more than about 235 characters without hearing the bleep which tells you the keyboard buffer is full.

This text is conveyed to the screen in a mere 0.2 sec.

In a tape-based (as opposed to disc-based) game which is loaded in its entirety into the computer before it is run, there is not much more than 20k available for a Basic program.

The memory available for text can be expanded by defining a text window in Mode 4 or 6 which restricts the size of the screen, and borrowing the released memory.

This device is used in Rick

```
10 REM Program II
20 LOC=5
30 DIM loc$(LOC)
40 RESTORE 5001
50 FOR IX=1 TO LOC:READ loc$(IX):NEXT
60 CLS:INPUT "SAVE file (Y/N)?";ans$
70 IF ans$<>"Y" AND ans$<>"y" THEN END
80 PRINT "Recording Data"
90 X=OPENOUT "DATA"
100 FOR IX=1 TO LOC:PRINT #X, loc$(IX):NEXT
110 CLOSE #X
120 END
130 REM Location Descriptions:
130 DATA "You push through some entangling holly bushes to find a large clearing in which stands a low building."
5001 DATA "You are in an octagonal room bathed in a shadow-free radiance by concealed lighting. Masterpieces of modern art line the walls. Archways lead off to E and W. N is a close-fitting door. An ornate chair is nearby."
5002 DATA "You are walking along a white, dusty road which runs north to south"
5003 DATA "The road bends east here. West is a gate leading to a tangled wood."
5004 DATA "The road widens and the marks of tracked vehicles can be seen on the verges."
5005 DATA "You push through some entangling holly bushes to find a large clearing in which stands a low building."
```

Program II

Hanson, though it makes for a rather unattractive display.

This means that no more than about 10k is available to hold location descriptions, equivalent to say 40 of full length.

So what of games which boast of more than 200 locations?

Machine code, even with text compression techniques, can't work miracles and the explanation is simply repetition, the same description being used for several different locations.

Again Rick Hanson is an example.

In order to print the description in Program I, the text has to be read into a string variable, loc\$, occupying 241 bytes, though the same space is used for all the other locations.

This means there is a waste of about five bytes per location over the whole game. The memory needed to store the printout procedure mustn't be forgotten, either.

One way of avoiding this duplication, paradoxically, is to read the data statements into a subscripted array.

This is saved as a data file, as shown in Program II. The entire database can be treated in this way.

When the game is run, the interpreter is first CHAINED, and immediately loads in the data file as in Program III:

```
10 REM Program III
20 LOC=5
30 DIM loc$(LOC)
40 PRINT "Loading Data"
50 X="DATA"
60 FOR IX=1 TO LOC:INPUT #X, loc$(IX):NEXT
70 CLOSE #X
80 INPUT "Enter location number: ";numberX
90 IF numberX<1 OR numberX>5 THEN VDU7:GOTO 80
100 TIME=0
110 CLS:PROC loc(numberX)
120 PRINT "Time taken was ";TIME;" sec"
130 GOTO 80
140 DEFPROC loc(nX)
150 PRINT TAB(0,10);loc$(nX)
160 ENDPROC
```

Program III

The database is then in a form which makes it easy to manipulate. To print out location description one, for instance needs only:

```
PRINT loc$(1)
```

This is still extravagant in its use of memory. The five strings in Program II total 559 characters and the data statements require 606 bytes of memory.

The array loaded from the file takes up 651 bytes, as shown by the increase in the value of the quantity !&2 AND &FFFF, which gives the address of the first vacant byte above a Basic program.

The method is also exasperating while a game is being developed, since any editing of the program means that the data file has to be re-loaded, a time-consuming business with tape.

Probably the best method overall is to abandon Basic and store text directly in memory at addresses determined by the programmer.

This is a step towards machine code programming which can be made from within a Basic program using indirection operators.

```
!&2000="dog"
```

will place the string "dog" at addresses &2000 to &2002 with a terminating carriage return byte &0D at location &2003 after the string. The address of the next free location is given by:

```
address=start+length+1
```

(But be warned: Indiscriminate poking — use of indirection operators — can seriously damage your Basic programs.)

This makes it relatively easy to store a series of strings compactly at any desired part of the memory free for use by the programmer, not currently in use by Basic or the screen.

Any string is printed on the screen by the command:

```
PRINT $address
```

where address is the location

Turn to Page 34 ►



# Programming

```

10 REM Program IV
20 :
30 CLS
40 INPUT "List to start
from: &"list$
50 listX=EVAL("&"list$)
60 FOR IX=0 TO &FFF:IX?LI
stX=0:NEXT
70 INPUT "Text to start
from: &"text$
80 textX=EVAL("&"text$)
90 INPUT "Number of last
item: "countX
100 RESTORE 5000
110 REPEAT:READ numberX,s
tring$
120 pointerX=listX+2*numb
erX
130 ?pointerX=textX MOD 2
56
140 ?(pointerX+1)=textX 0
IV 256
150 PROCcaption
160 $textX=string$
170 PROCprint
180 textX=textX+LEN($text
X)+1
190 PRINT "Press SPACE to
continue"
200 REPEAT:GX=GET:UNTIL G
X=32
210 UNTIL numberX=countX
220 PRINT "Next item is a
t address &";textX
230 PRINT "*** Any REPEA
TS (Y/N)?"
240 IF INSTR("Yy",GET$) T
HEN PROCrepeat
250 END
260 :
270 DEFPROCcaption
280 LX=LEN(STR$(numberX))
290 CLS
300 PRINT "Item no.;num
berX; starts at &";textX
310 PRINT STRING$(24+LX,"
=")
320 ENDPROC
330 :
340 DEFPROCprint
350 PRINT "STRING$(38,"
)
360 PRINT
370 FOR IX=1 TO LEN($text
X)
380 char$=MID$($textX,IX,
1)
390 IF char$=" " PRINT EL
SE PRINT char$;
400 NEXT IX
410 PRINT "STRING$(38,"
)
420 PRINT
430 ENDPROC
440 :
450 DEF PROCrepeat
460 CLS
470 INPUT "Index number
of item to be copied: 'mas
terX
480 PRINT "STRING$(38,"
)
490 PRINT "*** Enter 0 to
end"
500 REPEAT
510 PRINT
520 INPUT "Index number of
copy: 'copyX
530 IF copyX=0 THEN 560
540 IX=listX+2*copyX:JX=l
istX+2*masterX
550 ?IX=?JX:?(IX+1)=?(JX+
1)
560 UNTIL copyX=0
570 PRINT "STRING$(38,"
)
580 ENDPROC
590 :
600 REM Text
6000 DATA 0,Text 0
6010 DATA 1,Text 1
6020 DATA 8,Text 8

```

Program IV

## From Page 33

tion at which the string starts. Printing stops when the terminator &0D is reached.

In order to print the required string the addresses of the start byte of all the strings in the sequence must be stored in a table or list.

The location of the addresses is found by calculation from an index number allotted to each string.

Program IV allows location descriptions or messages to be entered as DATA statements and then transferred to storage in the region of the memory assigned to the database.

The data statements serve as a record which can easily be edited in the future.

Alternatively, as shown in Program V, the text can be entered at the keyboard, in which case the address list and text sequence should be recorded on tape or disc with:

\*SAVE <filename> AAAA ZZZZ

where AAAA is the start address in hex and ZZZZ is the address of the first free byte after the code.

The database might run, for example, from &2800 to &6000 in Mode 6, with messages at &3000-&3FFF, location descriptions at &4000-&6000, and address lists at &2900-&2AFF and at &2B00-&2BFF.

Another good feature is that duplication of location descriptions is particularly simple.

All that is required is to insert the same address at

```

10 REM Program V
20 :
30 CLS
40 INPUT "List to start
from: &"list$
50 listX=EVAL("&"list$)
60 FOR IX=0 TO &FFF:IX?LI
stX=0:NEXT
70 INPUT "Text to start
from: &"text$
80 textX=EVAL("&"text$)
90 REPEAT:CLS:INPUT "E
nter Index Number (500 to 9
UIT): "numberX
95 IF numberX=500 THEN 2
10
100 PRINT "Enter text:-
"
110 INPUT LINE string$
120 pointerX=listX+2*numb
erX
130 ?pointerX=textX MOD 2
56
140 ?(pointerX+1)=textX 0
IV 256
150 PROCcaption
160 $textX=string$
170 PROCprint
180 textX=textX+LEN($text
X)+1
190 PRINT "Press SPACE to
continue"
200 REPEAT:GX=GET:UNTIL G
X=32
210 UNTIL numberX=500
220 PRINT "Next item is a
t address &";textX
230 PRINT "*** Any REPEA
TS (Y/N)?"
240 IF INSTR("Yy",GET$) T
HEN PROCrepeat
250 END
260 :
270 DEFPROCcaption

```

Program V

```

280 LX=LEN(STR$(numberX))
290 CLS
300 PRINT "Item no.;num
berX; starts at &";textX
310 PRINT STRING$(24+LX,"
=")
320 ENDPROC
330 :
340 DEFPROCprint
350 PRINT "STRING$(38,"
)
360 PRINT
370 FOR IX=1 TO LEN($text
X)
380 char$=MID$($textX,IX,
1)
390 IF char$=" " PRINT EL
SE PRINT char$;
400 NEXT IX
410 PRINT "STRING$(38,"
)
420 PRINT
430 ENDPROC
440 :
450 DEF PROCrepeat
460 CLS
470 INPUT "Index number
of item to be copied: 'mas
terX
480 PRINT "STRING$(38,"
)
490 PRINT "*** Enter 0 to
end"
500 REPEAT
510 PRINT
520 INPUT "Index number of
copy: 'copyX
530 IF copyX=0 THEN 560
540 IX=listX+2*copyX:JX=l
istX+2*masterX
550 ?IX=?JX:?(IX+1)=?(JX+
1)
560 UNTIL copyX=0
570 PRINT "STRING$(38,"
)
580 ENDPROC

```

the required number of places in the address list. You can see this in Programs IV and V.

For each text string, one byte is wasted as the terminator carriage return and another two for the entry in the address list, a small overhead compared with Basic's string handling.

The procedure to print out the text stored in the database is short, though it is simplest to have two such procedures, one for short messages and one for location descriptions (which have separate address lists).

Program VI contains a procedure for printing location descriptions. A few bytes are saved by printing "You are" from the procedure rather than having it at the beginning of each string.

```

10 REM Program VI
20 INPUT "Enter index nu
mber: "numberX
30 PROCloc(numberX)
40 END
50 END
60 :
70 DEFPROCloc(nX)
80 listX=&3100 :REM or a
ny other convenient address
90 address=!(listX+2*nX)
AND &FFFF
100 TIME=0
110 PRINT "You are ";$add
ress
120 PRINT "Time taken w
as ";TIME;" csec"
130 ENDPROC

```

Program VI

A full length description is printed in 0.2 sec which is quite fast enough.

Next month we will see that some improvements can be made to this method of storing text, at the cost of more elaborate procedures for storing and recalling it from the database.



**TAX Calculator is a short utility enabling you to check your tax liability.**

The program asks you to input certain information before the calculation.

It needs to know what your tax code is, which tax period your next pay day will be in, how much you've earned, how much tax you've paid on those earnings and how much you expect your next pay to be before any deductions.

Your tax code, issued by the local tax office, is in the form 233L. The actual number can be almost anything but 233 is normal for single people or married women and 369 for married men or others who are claiming a married man's allowance (for instance a single parent).

The letter following the number is usually L, H or T. None of these letters affects the way in which tax is calculated. Certain other letters, however, may affect the calculation and are outside the scope of this program.

National Insurance calculations in the program are based on a person who pays NI contributions under weekly Table A.

This will cover all working men and single women who are not classed as self-employed, any working married women who are not entitled to be on B rate and is not self-employed, and in all cases, not contracted out of the state pension scheme and under the current legal retirement age.

The way that this program calculates your income tax is to start with your tax code. A code of 233 means that you may earn up to £2335 a year before you need to pay any tax. This is just under £45 a week. A married man with a tax code of 369 can earn £3695 a year or just under £72 a week, without incurring tax liability.

The amount of tax-free pay which you are entitled to for week X is calculated and this figure is deducted from the total wages earned for the current tax year, up to and including the week in which you will receive the amount entered in the input routine.

If your total taxable earning in any one tax year is less than £17,100, you will be taxed at the rate of 27 per cent.

If you exceed that figure, you will have to pay tax at 40 per cent on all taxable pay earned between £17,100 and £20,100. The rate then increases to 45 per cent for the next £3,000 spread. There are other bands up to 65 per cent and the program caters for these.

National Insurance is calculated differently. In this case there is a base line and a ceiling. Any earnings below the line, currently at £39, attract no contributions up to the maximum

amount payable of £25.80 a week irrespective of the amount earned.

For all points in between, the amount due depends on the gross pay for that week. From the base line to £70 the figure is 5 per cent and from £70.01 to the ceiling is paid at 9 per cent.

Unlike income tax calculations, amounts earned during the year have no effect. If you earn £20 one week and £100 the next, you will pay no NI contribution for the first week and £9 for the second.

Once the tax and NI has been

calculated your nett pay is found by subtracting these two amounts from your gross pay.

The bar chart shown in Figure 1 is drawn in Mode 1 and the figures - Tax, NI due, and Nett are shown both as money and as a percentage of your total earning that week.

If you have entered the information incorrectly or you are due a rebate the bars may exceed the limit of the screen. This should not be a problem and will leave you secure in the knowledge that you are due a nice fat tax rebate.



# Check up on the taxman

**BARRY WOOD's program takes the guesswork out of tax returns**

VARIABLES	
@%	Set to &20205 to format for monetary output.
nett	The money you are left with after deductions.
ni-due	How much NI you have to pay.
pay	Your total earnings to date.
pay-due	What you expect to be paid that week.
taxcode	Your tax code.
tax-to-date	Total amount of tax you have paid that year.
week	Number of the current tax week.

**Full listing starts on Page 36**

PROCEDURES	
enter	Get information from user.
calc-tax-rate	Calculates the rate of tax payable.
calc-ni-frac	Calculate the amount of NI to pay.
calc-graph	Work out lengths of bars on the graph.
draw-graph	Draws the bar graph.

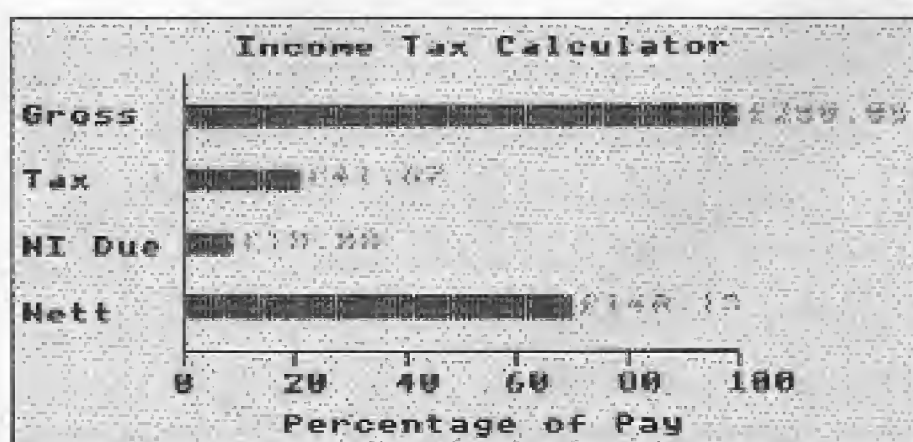


Figure 1: Sample output from Tax Calculator



## Tax calculator listing

### From Page 35

```

10 REM Tax Calculator
20 REM By Barry Wood
30 REM (c) Electron User
40 MODE1:DIM bar(3),money(3)
50 PRINT$C18 Income Tax Calculator
60 PROCcenter:VDU23,8202,0;0;0;
70 PROCcalc_tax_rate
80 PROCcalc_ni_frac
90 PROCcalc_graph
100 PROCdraw_graph
110 G=GET:VDU4
120 END
130 DEFPROCcenter
140 INPUT "Enter tax code (numbers only) :taxcode
150 INPUT "Enter pay earned to date :pay
160 INPUT "Enter tax paid to date :tax_to_date
170 INPUT "Enter tax week :week
180 INPUT "Finally enter pay due this week :pay_due
190 CLS:ENDPROC
200 DEFPROCcalc_tax_rate
210 tax_rate=0.27
220 IF pay+pay_due>17200 tax_rate=0.4
230 IF pay+pay_due>20200 tax_rate=0.45
240 IF pay+pay_due>25400 tax_rate=0.5
250 IF pay+pay_due>33300 tax_rate=0.55
260 IF pay+pay_due>41200 tax_rate=0.6
270 taxfree=(taxcode*10)+5
280 paytot=pay+pay_due
290 tax_due=(paytot-((taxfree/52)*week))*tax_rate
300 tax_to_pay=(INT((tax_due-tax_to_date)*100)/100)
310 ENDPROC
320 DEFPROCcalc_ni_frac
330 IF pay_due<39 ni_frac=0
340 IF pay_due>39 ni_frac=0.05
350 IF pay_due>65 ni_frac=0.07
360 IF pay_due>100 ni_frac=0.09
370 IF pay_due>295 ni_frac=0.1
380 ni_frac=pay_due*ni_frac:ENDPROC
390 DEFPROCcalc_graph
400 taxpl=(tax_to_pay/pay_due)*100
410 nipl=(ni_frac/pay_due)*100
420 nett=pay_due-tax_to_pay-ni_frac
430 bar(3)=750:money(3)=pay_due
440 taxbar=INT((tax_to_pay/pay_due)*750):bar(2)=taxbar:money(2)=tax_to_pay
450 nibar=INT((ni_frac/pay_due)*750):bar(1)=nibar:money(1)=ni_frac
460 nettbar=INT((nett/pay_due)*750):bar(0)=nettbar:money(0)=nett
470 ENDPROC
480 DEFPROCdraw_graph
490 VDU29,220;312;19,2,2;0;0;0
500 MOVE 0,0:DRAW 0,400:MOVE
0,0:DRAW 750,0
510 FOR X=0 TO 750 STEP 150
520 MOVE X,0:DRAW X,-20:VDU5:MOVE X+10,-30:PRINTX/7.5:
NEXT:VDU4
530 PRINTTAB(0,11) Gross PAY
(0,14) Tax TAB(0,17) NI Due TAB(0,20) Nett TAB(11,25) Percentage of Pay TAB(9,8) Income Tax Calculator
540 Y=50:FOR N=0 TO 3:X=0:PRINTX:PROCbars:Y=Y+92:NEXT:ENDPROC
550 DEFPROCbars:Y=82020
560 MOVE X,Y:MOVE X,Y+30:GCOLOR,2:PLOT 85,0,Y:PLOT85,0,Y+30:GCOLOR,1
570 MOVE X+10,Y+30:VDU5:PRINTX/money(X)
580 ENDPROC

```

This listing is included in this month's cassette tape offer. See order form on Page 53.

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# Lost without Super Trace

**ROLAND WADDILOVE provides a useful program to track down those elusive bugs**

BBC Basic is one of the most powerful and flexible versions of Basic available. However, while it does possess some quite advanced features to aid program development such as procedures and local variables, one or two commands aren't that useful and could be improved.

TRACE, when implemented correctly, is a powerful debugging command that enables you to chart the path of a program. You can follow Basic's route through a listing as it executes your procedures, GOSUB, GOTO and other commands.

Bugs or typing errors in programs are difficult to spot at the best of times, and the micro occasionally reports an error at the wrong line. By stepping through a program line by line you can often spot where it is going wrong.

This is where the TRACE command comes in. Inserting TRACE ON at the start of a program instructs Basic to print the line number of the line it is executing.

However, the line numbers are printed at the current print position and more often than not they totally corrupt the screen display. This isn't very helpful.

Super Trace is a short machine code utility which modifies the TRACE command making it much more useful.

Enter and save the program then run it to store the

code. Now you can load or enter your program. Insert a TRACE ON command near the start of the program and a TRACE OFF at the end. Now run it.

The line number of the line that Basic is executing is printed in the top left corner of the screen and the new Super Trace command waits for you to press a key. Tap the spacebar and Basic moves on to the next line.

Figure I shows a simple program and the output generated by the normal TRACE command, while Figure II shows the new Super Trace in action.

The modified command does not corrupt the screen display – the line number is always printed in the top left corner in square brackets yet the current print position is unaffected.

After tapping a key the program will continue exactly where it left off, even if it was in the middle of printing a row of characters.

The routine works by intercepting oswrch – the main vdu vector. Basic sends all output to the screen through this so it's an easy matter to check for an open square bracket.

When one is found the routine assumes that Basic is about to print the TRACE line number and redirects the output to the top left corner of the screen.

When a close square bracket character is detected the original print position is

restored and Basic continues as normal.

This utility will prove an invaluable aid when tracking down those elusive bugs and typing slips. Keep it handy on a disc or tape and

run it before typing in a program. Now you can step through a listing and watch Basic processing each line.

**Full listing starts on Page 38**

```
>L.
10REM Normal TRACE Command
20TRACE ON
30FOR i=ASC"a" TO ASC"z"
40PRINT CHR$(i);
50NEXT
60*SAVE SCREEN 5800 8000
70TRACE OFF
>
>RUN
[30] [40] a[50] b[50] c[50] d[50] e[50]
f[50] g[50] h[50] i[50] j[50] k[50] l[50]
m[50] n[50] o[50] p[50] q[50] r[50] s[50]
t[50] u[50] v[50] w[50] x[50] y[50] z[50] [60]
```

Figure I: The normal TRACE command

```
[60]
>L.
10REM Super Trace Demonstration
20TRACE ON
30FOR i=ASC"a" TO ASC"z"
40PRINT CHR$(i);
50NEXT
60*SAVE SCREEN 5800 8000
70TRACE OFF
>
>RUN
abcdefghijklmnopqrstuvwxyz
```

Figure II: The new Super Trace command



## Super Trace listing

### From Page 37

```

10 REM Super Trace
20 REM By R.A.Waddilove
30 REM (c) Electron User
40 MODE 8
50 PRINT "Where shall I put
the code?"
60 INPUT "Hit RETURN if un
sure):&a$
70 IF a$="" a$="800"
80 trace=820
90 vector=820E
100 osbyte=1620A AND 8FFFF
110 osrdch=16210 AND 8FFFF
120 x=850:y=851
130 space=852
140 xreg=853:yreg=854
150 FOR pass=0 TO 2 STEP 2
160 PX=EVAL(4+a$)
170 EOPT pass
180 .intercept
190 LDA vector+1:SP done
200 SEI
210 LDA vector:STA oswrch+1:
LDA vector+1:STA oswrch+2
220 LDA =code MOD 256:STA vec
tor:LDA =code DIV 256:STA vecto
r+1
230 LDA 10:STA space
240 CLD
250 .done
260 RTS
270

```

```

280 .code
290 PHP:PHA
300 LDA trace:BEG exit 1TRA
CE ON?
310 LDA 426A:BNE exit 1nidd
le of VDU queue?
320 LDA space:BEG Lbracket 1

```

```

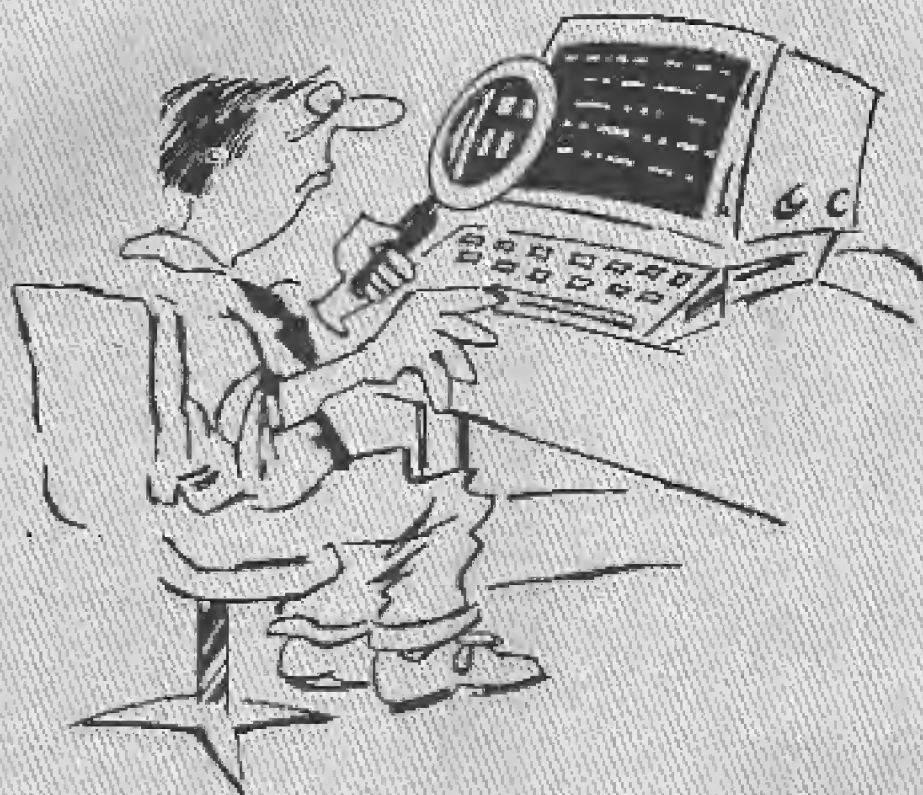
finished 10?
330
340 LDA #0:STA space
350 LDA #12:JSR oswrch
360 LDA #31:JSR oswrch:LDA x
:JSR oswrch:LDA y:JSR oswrch 1
old cursor position

```

```

370 JSR osrdch 1wait
380 PLA:PLP
390 RTS
400
410 .Lbracket
420 PLA:PHA:CMP #ASC":BNE
Rbracket
430 STX xreg:STY yreg
440 LDA #886:JSR osbyte:STX
x:STY y 1store cursor position
450 LDY xreg:LDY yreg
460 LDA #50:JSR oswrch 1top
left corner
470 .exit
480 PLA:PLP
490 .oswrch
500 JMP 88023
510
520 .Rbracket
530 CMP #ASC":BNE exit
540 INC space:BNE exit
550 J
560 NEXT
570 CALL intercept
580 PRINT "Super Trace insta
led..."

```



This listing is included in this month's cassette tape offer. See order form on Page 53.

electron  
user

MAIL ORDER OFFERS

electron  
user

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## Programs from Electron User – on tape

### July 1987

**MAZEBUGS** Fight the guardians of the labyrinth. **MORRIS** An ancient game of strategy. **CALCULATOR** Turn your Electron into an adding machine. **BIOMORPHS** Play the generation game. **SUPER TRACE** Upgrade Basic's TRACE routine. **10 LINERS** Two short but impressive listings. **AUTOMATION** Create amazing graphic displays. **TAX CALCULATOR** Check up on your PAYE deductions.

### June 1987

**HUNGRY HARRY** brush up on your mental arithmetic with this educational game. **CUBIT** Paint the pyramid in this fast multi-screen arcade classic. **FLASHERS** Create eight new Mode 2 flashing colours. **PATIENCE** Try your hand at this classic card game. **10 LINERS** Two short, yet most impressive listings. **DRAGON CURVE** A graphic demonstration of recursion.

### May 1987

**HECTIC HENRY** Escape from the maze and collect the gems in this super arcade game. **SPELLING CHECKER** Check the spelling in your View files. **MANDELBROT** Explore the amazing world of fractal geometry. **DISC MENU** A super utility to organise your DFS and ADFS discs. **ANIMALS** A fun educational game featuring artificial intelligence. **10 LINERS** Two short, yet impressive listings.

### April 1987

**DRAGON'S DOOM** A fun educational game for youngsters learning to tell the time. **GRIDDER** A fascinating puzzle that will strain your brain. **WIMPS** A complete desktop environment with windows, icons, menus and pointers. **10 LINERS** Two short, yet impressive listings.

### March 1987

**SUPER BOSS** Try for the league and FA cups in this exciting football management simulation. **AWARI** A classic African board game for one or two players. **ELKZAP** Recover lost files with this powerful Plus 4 disc editor. **10 LINERS** Two short, yet impressive listings.

### February 1987

**MAZE** Escape from the creepy castle. **KEYBOARD PLAYER** Turn your micro into an electronic organ. **TOMMY** Guide little Tommy through the woods. **CARPET** An impressive graphics display. **GCOL** Experiment with extra colours. **10 LINERS** Two short but impressive listings.

### January 1987

**GRID WARRIOR** Battle with alien gladiators deep in space. **MODE 7** A

Mode 7 simulator providing teletext graphics. **SMILEY HUNT** The final version of Al's scintillating magagame. **10 LINERS** Zap the alien intruder and dodge the asteroids. **LISTER** A utility to enable you to list programs directly from disc or tape.

### December 1986

**SANTA'S SLEIGH** Help Father Christmas fill his sleigh with presents in this fast arcade game. **YULE SPELL** Spelling can be fun with this seasonal variation on the old favourite hangman. **POGO** A Logo turtle graphics compiler. **FUNCTION KEY LISTER** Keep track of your function key definitions with this helpful utility. **10 LINERS** Two short but impressive graphics demonstrations.

### November 1986

**TRAIN TROUBLE** You've just robbed a bank. Can you escape the forces of law and order in this chase over the carriages of a fast moving express? **DAY AT THE RACES** You can gamble away to your heart's content in safety with our entertaining two player horse racing game. **BASIC COMPILER** This superb utility will turn your Basic programs to machine code in no time at all. **10 LINERS** A routine from our fascinating series of short programs.

**Only £3.95 each**

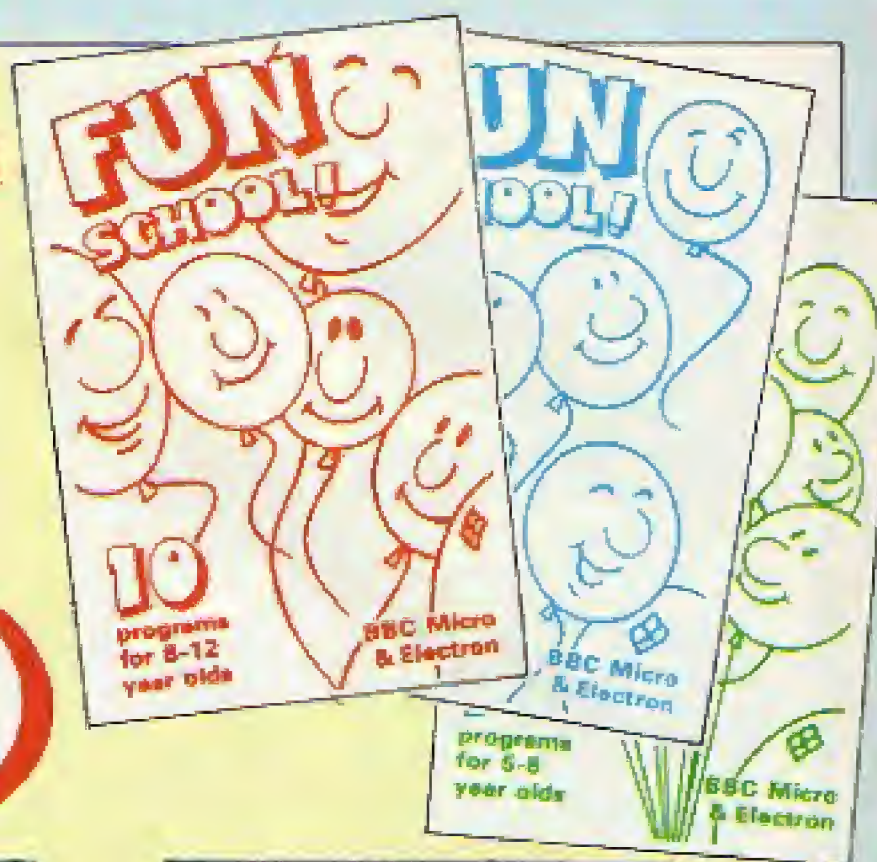
To order, use the form on Page 53



# Learning CAN be fun

- Use your Electron to teach and amuse your children at the same time.
- Three packages crammed full of educational programs – and so easy to use!
- Each program has been educationally approved after extensive testing in the classroom.

ONLY  
£4.95 tape  
£5.95  
3½" disc



## Ages 2-5

Alphabet  
Colours  
Counting  
House  
Magic Garden  
Matchmaker  
Numbers  
Pelican  
Seaside  
Snap



**PELICAN**  
Teach your children to cross the road safely at a Pelican crossing



**HOUSE**  
Select the colours to draw a house – hours of creative entertainment

## Ages 5-8

Balance  
Castle  
Derrick  
Fred's Words  
Hilo  
Maths Test  
Mouser  
Number Signs  
Seawall  
Super Spell



**NUMBER SIGNS**  
Provide the correct arithmetic sign and aim to score ten out of ten



**BALANCE**  
Learn maths the fun way. Type in the answer to balance the scales

## Ages 8-12

Anagram  
Codebreaker  
Dog Duck Corn  
Guessing  
Hangman  
Maths Hike  
Nim  
Odd Man Out  
Pelmanism  
Towers of Hanoi



**HANGMAN**  
Improve your child's spelling with this fun version of the popular game



**ODD MAN OUT**  
Find the word that does not fit – before your time runs out

**TO ORDER TURN TO THE FORM ON PAGE 53**



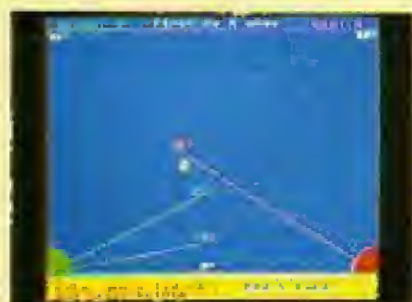


... up to £5 on nine  
quality educational  
programs

*Full-length programs  
designed to stimulate,  
educate and entertain  
— in school and at home*



**Windmill:** Word, number  
and colour recognition



**Angler:** Fun with angle  
estimation



**Spelldroid:** Learn to spell  
with our friendly robot



**Tortal:** Teach and test  
the rules of single addition

#### PLUS:

**Database: A**  
comprehensive database  
for the young learner.

**Chinese Takeaway:**  
Teach and test the rules  
of simple subtraction.

**Fun Factors:** Arcade  
style factor learning.

**Discovery:** A strategy  
based phrase  
identification game.

**Punctuation:** Test and  
teach the rules of  
punctuation.

## Educational Computing on the Electron

Volume 2 of *The Micro User*  
Education Special contains nine full  
length programs written to the  
highest standards and each picked to  
combine educational worth with  
sheer enjoyment. The nine programs  
cover topics from early reading and  
simple sums to the rules of  
punctuation and angle estimation —  
and there's an excellent introductory  
database.

The programs on the tape and disc  
have been adapted for the Electron  
and the magazine contains all the  
original listings together with advice  
on how they can be adapted to cater  
for individual needs.

Covers all age ranges from infants  
to secondary.



+

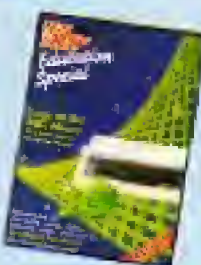


=

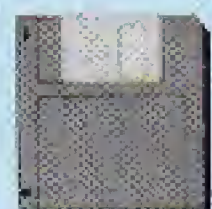
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Normal price £5.95

**£2  
Saving!**



+



=

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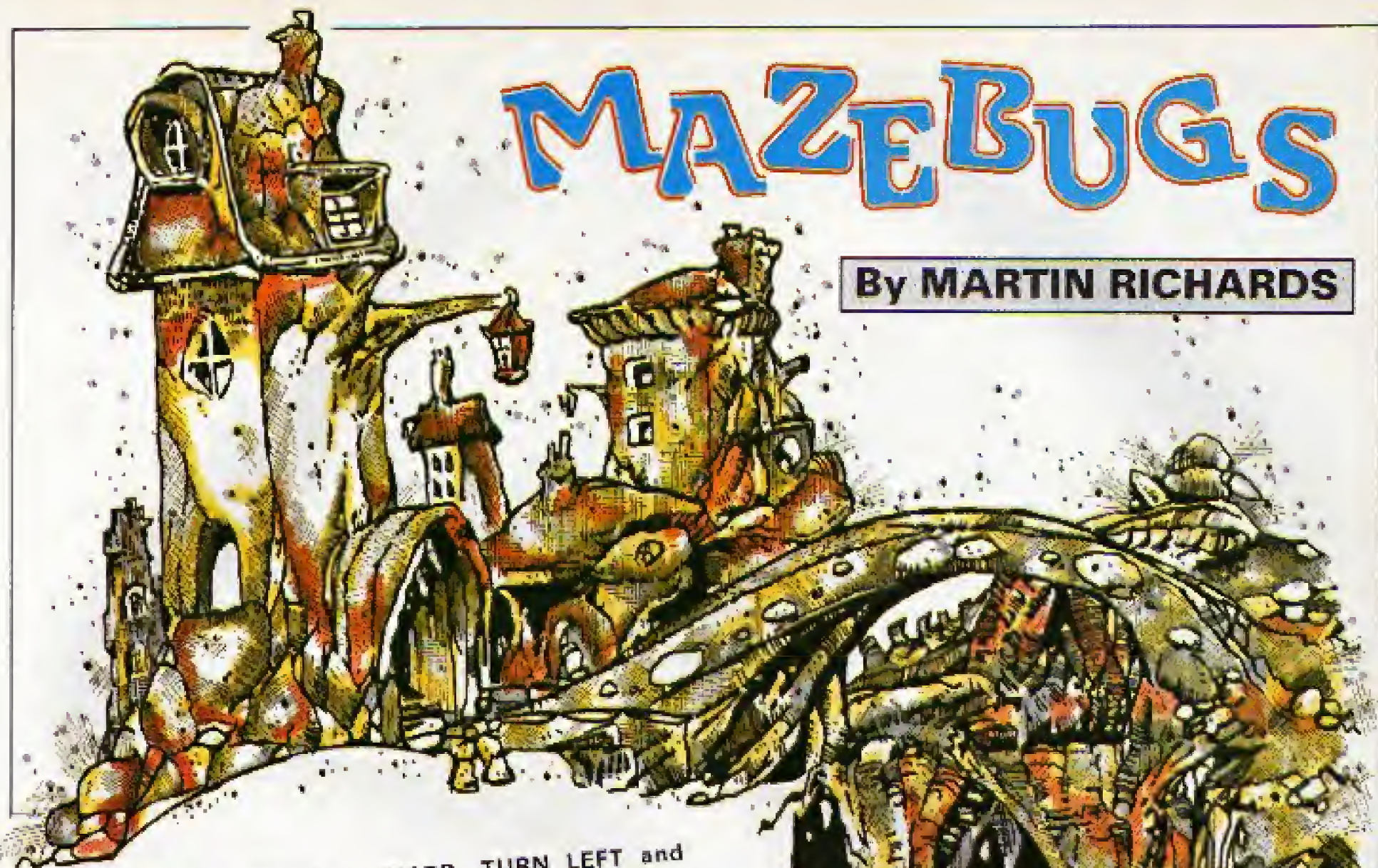
**£5  
Saving!**

**To order turn to the  
form on Page 53**



# MAZEBUGS

By MARTIN RICHARDS



MAZEBUGS is a graphic adventure with you cast as chief wizard of the Great Temple in the city of Axon.

Your most prized possession is a chalice of gold with magical powers that is on show in the main hall of the temple.

A jealous rival wizard sneaks into the temple to steal the chalice in an effort to depose you.

He hides it in the middle of a maze of lookalike passages. This maze is inhabited by carnivorous mazesbugs and these hideous creatures walk the dank corridors gobbling up any adventurer who dares enter.

After many days travel you finally reach the maze. As you enter an invisible barrier is erected barring your exit as the mazesbugs advance.

Your only hope of survival is to fight the monstrous creatures, find the chalice and use its magical powers to raise the barrier and return to Axon.

Your adventure starts at the entrance and the upper part of the screen display gives a 3D perspective view of the maze in front of you.

The lower half of the screen is reserved for text and you can enter commands such as GO FOR-

WARD, TURN LEFT and TURN RIGHT.

Although the vocabulary is quite small, the parser is fairly intelligent and will understand complex sentences such as "Hit mazesbug with beer can", though it is best to keep them simple.

Each time you move to a new location the display is re-drawn to show your new position.

As you explore the maze you'll find weapons to fight the mazesbugs (you can try hitting them with your fist if you haven't anything else). Tools, food and drink are also available as well as an old parchment map.

You can discover quite a lot by studying the listing, but it's no use trying to find where the mazesbugs or chalice are.

They are all placed in different locations each time you play. This means that unlike other adventures, once you have solved the game you can play it again and it will be completely new. If you wish you can even re-design the maze.

This super adventure will keep you occupied for hours so get cracking and good luck.

Full listing starts on Page 43





# More great Electron games

This month we introduce a new volume in our Ten of the Best series – 10 more games to give you many hours of fun and entertainment.

These four packages are crammed with the best games from the last two years of Electron User. As an added bonus a previously unpublished game has been added to each one – stunning machine code masterpieces from our technical wizard, Roland Waddilove.

So give yourself a treat... with the most popular games compilations we've ever produced.



## Volume 1

**Jam Butty:** Machine code simulation of high drama on a building site.

**Golf:** Play a round by yourself, or play against your pals.

**Haunted House:** Fight against all the odds to get out alive.

**Space Hike:** Another classic. Help the spaceman avoid marauding monsters.

**Parky's Peril:** Help Parky through an invisible maze, racing against time.

**Rally Driver:** All the thrills of high-speed driving with none of the risks.

**Alphaswap:** Your letters are in a twist. Can you put them in order.

**Knockout:** Fast and furious action as you batter down a brick wall.

**Money Maze:** Avoid ghosts and collect coins in an all-action arcade classic.

**Lunar Lander:** The traditional computer game specially written for the Electron.

## Volume 2

**Atom Smash:** Machine code thrills as you help to save the world from destruction.

**Bunny Blitz:** Go egg collecting, but keep away from proliferating rabbits.

**Castles of Sand:** Build castles – but beware the rising tide and hungry sandworms.

**Reaction Timer:** Test your reactions with this traffic lights simulation.

**Solitaire:** The Electron version of the age-old game

of logic and patience.

**Jumpert:** Jump for your life in this exciting arcade action game.

**Break free:** Test your wits and reflexes in this popular classic ball game.

**Code breaker:** Crack the code in a colourful if frustrating brainteaser.

**Parachute:** Save the plunging sky divers from a watery end.

**Star fighter:** Attack the bandit ships in this fast-moving 3D punch up.

## Volume 3



**Rockfall:** Come diamond mining in this fun packed game with its own screen designer.

**Karate Warrior:** Win your black belt in this gruelling test of karate skill.

**Grand Prix:** Battle your way into the lead in this tricky racing simulation.

**Invasion Force:** Can you survive wave after wave of relentlessly advancing aliens.

**Grebit:** Guide the frog across the busy road then across the fast-flowing river!

**Fruit Worm:** Steer the worm towards the fruit while avoiding rocks and its ever-growing tail.

**Manic Mole:** Watch out for melting platforms and conveyor belts in your quest for jewels.

**Skramble:** Fly your fighter fast and low over the landscape to penetrate enemy territory.

**Mr. Freeze:** You'll need speed and strategy to reach the ice blocks before they melt away.

**Paint Roller:** Steer a speeding roller, run over paint pots but keep clear of the rocks.

## Volume 4



**Lunar Invasion:** Defend the moon from wave after wave of marauding aliens in this superb multi-screen arcade game.

**Howzat:** Try not to get caught out in this vivid recreation of a day's test cricket.

**Snapdragon:** Enjoy this two-player micro version of the familiar card game.

**Day at the Races:** Fancy a flutter? You can bet your shirt in safety in this two-player horse racing game.

**Reversi:** Combine cunning and chance as you try to out-think your Electron at this classic

board game.

**Fishing:** Relax and enjoy a quiet afternoon by a shady brook. You'll regret if you let this one get away.

**Cavern Capers:** Escape from the depths of the planet by blasting oil drums and dodging deadly fireballs.

**Graal:** Escape from the maxe and win the beautiful princess in this superb text adventure.

**Oxo:** High strategy meets low cunning in a logic game to strain your brain.

**Missile Attack:** Defend your city from a missile invasion and save it from certain doom.

TO ORDER TURN TO THE FORM ON PAGE 53



## Mazebugs listing

### ◀ From Page 41

```

10 REM Mazebugs
20 REM By Martin Richards
30 REM (c) Electron User
40 IF PAGE=41000 GOTO 4570
50 PROCassemble:CLEAR
60 PROCinitialise
70 MODE4:VDU23,1,0;0;0;0;
80 PROCinstructions
90 MODE5:VDU23,1,0;0;0;0;
100 PROCview
110 REPEAT
120 PROCany_objects
130 PROCattack
140 PROCcommand
150 UNTIL Y1=10 OR energy<1
160 IF energy<1 PROCdead
170 IF Y1=10 PROCdone_it
180 MODE 6:FX4
190 END
200
210 DEF PROCdead
220 PROCpause(200)
230 RESTORE 1000
240 FOR IX=1 TO 11
250 READ AX,BX
260 SOUND 1,-15,AX,B: SOUND
1,0,0,1
270 NEXT
280 CLS:COLOUR2:PRINT"You're
dead... Eaten by a mazebug."
:COLOUR1:PRINT"Strength=0"
:Mazebugs killed=:dead;
290 PROCpause(500)
300 ENDPROC
310
320 DEF PROCdone_it
330 PROCinventory:PROCpause(
400)
340 PRINT:PROCstore
350 SOUND 1,-15,40,5:SOUND 1
,-15,20,5:SOUND 1,-15,20,20
360 CLS:VDU 26,23,1,0;0;0;0;
370 MOVE 180,200:GCOL 0,3:HX
=3:VX=1:BIGS="CONGRATULATIONS"
:CALL 8900,BIGS:MOVE 310,300:H
X=2:GCOL 0,2:BIGS="you made it"
:CALL 8900,BIGS
380 PROCpause(500)
390 ENDPROC
400
410 DEF PROCview
420 VDU 19,2,6;0;
430 GCOL 0,3
440 MOVE 40,396
450 DRAW 40,1023:DRAW 1240,1
023
460 DRAW 1240,396:DRAW 40,39
6
470 VDU 24,40;400;1235;1019,
480 VDU 29,640;700;
490 PROCdraw
500 VDU 20,0,31,19,21
510 ENDPROC
520
530 DEF PROCinitialise
540 FX4,1
550 VDU 23,224,255,129,129,1
29,129,129,129,255
560 VDU 23,225,195,60,90,255
,251,126,36,102
570 VDU 23,226,24,60,24,126,
189,60,36,102
580 VDU 23,227,0,0;0,195,126
,24,24,126
590 VDU 23,228,81,172,85,170
,85,170,85,170
600 DIM maze$(11),hole$(10),
object$(10),place(10,1),carry

```



```

ng(4),bug(10,1),strength(10)
610 RESTORE 870
620 FOR IX=0 TO 11
630 READ maze$(IX)
640 NEXT
650 FOR IX=0 TO 10
660 hole$(IX)=STRINGS(10,"
")
670 strength(IX)=RND(10)
680 REPEAT X3=RND(17):YX=RND
(7)
690 UNTIL NOT FNwall(X3,YX)
700 bug(IX,0)=XX:bug(IX,1)=Y
%
710 NEXT
720 FOR IX=0 TO 4
730 carrying(IX)=1
740 NEXT
750 FOR IX=0 TO 10
760 READ object$(IX)
770 REPEAT
780 X2=RND(17):YX=RND(8)
790 UNTIL NOT FNwall(X2,YX)
800 place(IX,0)=XX:place(IX,
1)=YX
810 NEXT
820 X1=10:Y1=9:direction=0
830 energy=100:drunk=FALSE
840 dead=0:FX16
850 ENDPROC
860
870 DATA *****
880 DATA +.+.+.+.+.+.+.+.+.
890 DATA +.+.+.+.+.+.+.+.+.
900 DATA +.+.+.+.+.+.+.+.+.
910 DATA +.+.+.+.+.+.+.+.+.
920 DATA +.+.+.+.+.+.+.+.+.
930 DATA +.+.+.+.+.+.+.+.+.
940 DATA +.+.+.+.+.+.+.+.+.
950 DATA +.+.+.+.+.+.+.+.+.
960 DATA *****
970 DATA .....
980 DATA .....
990 DATA The castle,an appl
e,A gold coin,A map,an axe,A s
word,A dagger,A club,A hammer,
A beer can,A spade
1000 DATA 40,14,40,14,40,7,40
,14,52,14,46,7,48,14,40,7,48,1
4,36,7,40,20
1010
1020 DEF PROCany_objects
1030 FOR IX=0 TO 10
1040 IF place(IX,0)=XX AND pl
ace(IX,1)=YX PRINT object$(IX)
:" is here."
1050 NEXT
1060 ENDPROC
1070
1080 DEF PROCattack
1090 flag=FALSE

```

```

1100 FOR IX=0 TO 10
1110 IF bug(IX,0)=XX AND bug(
IX,1)=YX flag=TRUE
1120 NEXT
1130 IF NOT flag ENDPROC
1140 energy=energy-RND(3)
1150 PRINT"The Mazebug attac
ks:You are :
1160 IF RND>2 PRINT"hit with
a claw... ELSE PRINT"bitten
..."
1170 SOUND 0,-15,5,5
1180 ENDPROC
1190
1200 DEF PROCcommand
1210 ok=FALSE
1220 REPEAT
1230 PRINT:PROCinput
1240 IF command$="turn" PRINT
"Which way?":PROCinput
1250 IF INSTR(command$,"left"
) direction=(direction+3)MOD4:
PROCdraw:ok=TRUE
1260 IF INSTR(command$,"right"
) direction=(direction+1)MOD4
:PROCdraw:ok=TRUE
1270 IF INSTR(command$,"forwa
rd") PROCmove
1280 IF LEFT$(command$,3)="in
v" PROCinventory
1290 IF LEFT$(command$,3)="ge
t" OR LEFT$(command$,3)="tak
e" PROCget
1300 IF LEFT$(command$,4)="dr
op" PROCdrop
1310 IF LEFT$(command$,4)="dr
ink" PROCdrink
1320 IF LEFT$(command$,3)="di
g" PROCdig
1330 IF LEFT$(command$,4)="lo
ok" PROClook
1340 IF LEFT$(command$,3)="ea
t" PROCeat
1350 IF LEFT$(command$,3)="h
it" OR LEFT$(command$,4)="stab"
PROCkill
1360 IF command$="score" PROC
score
1370 IF NOT ok PRINT"Err?"
1380 UNTIL ok
1390 ENDPROC
1400
1410 DEF PROCinput
1420 LOCAL X,YX
1430 COLOUR3
1440 X1=POS:Y1=VPOS
1450 VDU23,1,1;0;0;0;:FX21
1460 REPEAT
1470 INPUT TAB(X,Y):COMMAND$
$
1480 UNTIL LEN COMMAND$

```

```

1490 command$=""
1500 FOR IX=1 TO LEN COMMAND$
1510 command$=command$+CHR$(A
SC MID$(COMMAND$,IX,1)OR 320)
1520 NEXT
1530 VDU23,1,0;0;0;0;
1540 COLOUR2
1550 ENDPROC
1560
1570 DEF PROCscore
1580 ok=TRUE
1590 PRINT"Strength=:energy
1600 PRINT"Mazebugs killed=:
dead;
1610 ENDPROC
1620
1630 DEF PROCinventory
1640 ok=TRUE:CLS:flag=FALSE
1650 PRINT"You have:
1660 FOR IX=0 TO 4
1670 IF carrying(IX)>-1 flag=
TRUE:PRINT object$(carrying(IX
))
1680 NEXT
1690 IF NOT flag PRINT"Nothing
b!"
1700 ENDPROC
1710
1720 DEF PROCdraw
1730 GCOL 0,2:CLS
1740 MOVE 600,1019:MOVE -600,
1019
1750 PLOT 85,600,B:PLOT 85,-6
00,B
1760 IF direction=0 PROCnorth
1770 IF direction=1 PROCeast
1780 IF direction=2 PROCsouth
1790 IF direction=3 PROCwest
1800 PROCbug
1810 ENDPROC
1820
1830 DEF PROCbug
1840 LOCAL X,YX
1850 X1=0:Y1=0:AX=XX:BX=YX:HX
=2
1860 IF direction=0 Y1=-1
1870 IF direction=1 X1=1
1880 IF direction=2 Y1=1
1890 IF direction=3 X1=-1
1900 REPEAT
1910 FOR IX=0 TO 10
1920 IF bug(IX,0)=AX AND bug(
IX,1)=BX HX=10-2*ABS(X1-A1+Y1-
B1)
1930 NEXT
1940 A2=A1-X1:B2=B1+Y1
1950 UNTIL FNwall((AX,B1) OR 0
3 63 B1>10
1960 IF HX VX=HNDIV2:B1G1=CHR
$225:MOVE -HX*16,-HX*32-B:CALL
8900,B1G1
1970 ENDPROC
1980
1990 DEF PROCsouth
2000 BX=YX+6:IF B2=10 B1=10
2010 REPEAT
2020 IF FNwall((X1+1,B1) PROCt
est(6-B1+Y1)
2030 IF FNwall((X2-1,B1) PROCf
ight(6-B1+Y1)
2040 IF FNwall((X1,B1) PROCdra
wt(6-B1+Y1)
2050 BX=BX-1
2060 UNTIL BX<1X
2070 ENDPROC
2080
2090 DEF PROCnorth
2100 BX=YX-6:IF B2<0 B1=0

```

Turn to Page 44 ▶



## Mazebugs listing

### ◀ From Page 43

```

2110 REPEAT
2120 IF FNwall(X%+1,B%) PROCright(4-B%-Y%)
2130 IF FNwall(X%-1,B%) PROCleft(4-B%-Y%)
2140 IF FNwall(X%,B%) PROCfront(6+B%-Y%)
2150 B%=B%+1
2160 UNTIL B%>Y%
2170 ENDPROC
2180
2190 DEF PROCwest
2200 AX=X%-6:IF AX<1 AZ=1
2210 REPEAT
2220 IF FNwall(AZ,Y%+1) PROCleft(6-AZ-X%)
2230 IF FNwall(AZ,Y%-1) PROCright(6-AZ-X%)
2240 IF FNwall(AZ,Y%) PROCfront(6-AZ-X%)
2250 AZ=AZ+1
2260 UNTIL AZ>X%
2270 ENDPROC
2280
2290 DEF PROCeast
2300 AX=X%+6:IF AX>10 AZ=10
2310 REPEAT
2320 IF FNwall(AZ,Y%-1) PROCleft(6-AZ-X%)
2330 IF FNwall(AZ,Y%+1) PROCright(6-AZ-X%)
2340 IF FNwall(AZ,Y%) PROCfront(6-AZ-X%)
2350 AZ=AZ+1
2360 UNTIL AZ>X%
2370 ENDPROC
2380
2390 DEF PROCfront(S%)
2400 GCOL 0,1:MOVE -100*S%,-50*S%:MOVE 100*S%,50*S%:PLOT 85,-100*S%,50*S%:PLOT 85,100*S%,50*S%
2410 GCOL 0,3:MOVE -100*S%,-50*S%:DRAW 100*S%,50*S%:DRAW 100*S%,50*S%:DRAW -100*S%,50*S%:DRAW -100*S%,50*S%
2420 ENDPROC
2430
2440 DEF PROCleft(S%)
2450 GCOL 0,1:MOVE -300*S%,-50*S%:MOVE -100*S%,-50*S%:PLOT 85,-300*S%,50*S%:PLOT 85,-100*S%,50*S%:MOVE -100*(S%-1),50*(S%-1):PLOT 85,-100*(S%-1),50*(S%-1):PLOT 85,-100*(S%-1),50*(S%-1)
2460 GCOL 0,3:MOVE -100*S%,-50*S%:DRAW -300*S%,50*S%:DRAW -100*S%,50*S%:DRAW -100*(S%-1),50*(S%-1):DRAW -100*(S%-1),50*(S%-1):DRAW -100*(S%-1),50*(S%-1):DRAW -100*(S%-1),50*(S%-1)
2470 ENDPROC
2480
2490 DEF PROCright(S%)
2500 GCOL 0,1:MOVE 300*S%,-50*S%:MOVE 100*S%,-50*S%:PLOT 85,300*S%,50*S%:PLOT 85,100*S%,50*S%:MOVE 100*(S%-1),50*(S%-1):PLOT 85,100*(S%-1),50*(S%-1):PLOT 85,100*(S%-1),50*(S%-1)
2510 GCOL 0,3:MOVE 100*S%,-50*S%:DRAW 300*S%,50*S%:DRAW 100*S%,50*S%:DRAW 100*(S%-1),50*(S%-1):DRAW 100*(S%-1),50*(S%-1):DRAW 100*(S%-1),50*(S%-1):DRAW 100*(S%-1),50*(S%-1)
2520 ENDPROC

```

```

2530
2540 DEF PROCmove
2550 LOCAL x%,y%
2560 flag=FALSE:ok=TRUE
2570 FOR IX=0 TO 10
2580 IF bug(IX,0)=X% AND bug(IX,1)=Y% flag=TRUE
2590 NEXT
2600 IF flag IF RND>2 PRINT "The Mazebug blocks your path." :ENDPROC
2610 X%=X%:Y%=Y%
2620 IF direction=0 Y%=Y%+(Y%>0)
2630 IF direction=2 Y%=Y%+1
2640 IF direction=1 X%=X%-(X%<10)
2650 IF direction=3 X%=X%-(X%>1)
2660 IF FNwall(X%,Y%) PRINT "Wall in the way!" :ENDPROC
2670 IF Y%=10 AND FNpossess(0)<0 PRINT "You cannot leave without the chalice!" :SOUND 1,-15,0,20 ELSE X%=X%:Y%=Y%:PROCmove:bug:PROCdraw:CLS:energy=energy-1
2680 ENDPROC
2690

```

This is one of hundreds of programs now available FREE for downloading on

**MicroLink**

```

2700 DEF PROCmove_bugs
2710 LOCAL x%,y%
2720 FOR IX=0 TO 10
2730 X%=bug(IX,0):Y%=bug(IX,1)
2740 IF RND>0 X%=X%+RND(3)-2 ELSE Y%=Y%+RND(3)-2
2750 flag=FALSE
2760 FOR JX=0 TO 10
2770 IF JX<>IX AND bug(JX,0)=X% AND bug(JX,1)=Y% flag=TRUE
2780 NEXT
2790 IF Y%<10 AND NOT (flag OR FNwall(X%,Y%)) PROCcheck_hole
2800 NEXT
2810 ENDPROC
2820
2830 DEF PROCcheck_hole
2840 IF MID$(holes(Y%),X%,1) = bug(IX,0)=X%:bug(IX,1)=Y%:ENDPROC
2850 FOR JX=0 TO 200 STEP 4
2860 SOUND 1,-15,JX,1
2870 NEXT
2880 SOUND 0,-15,5,10
2890 PRINT "A bug fell down a hole..."
2900 bug(IX,0)=0:bug(IX,1)=10:dead=dead+1
2910 ENDPROC
2920
2930 DEF FNwall(x%,y%)
2940 IF MID$(maze$(y%),x%,1) = " THEN =TRUE ELSE =FALSE
2950
2960 DEF FNpossess(it)
2970 LOCAL flag,IX:flag=-1
2980 FOR IX=0 TO 4
2990 IF carrying(IX)=it flag=IX
3000 NEXT

```

```

3010 =flag
3020
3030 DEF FNlast_word(temporary$)
3040 LOCAL IX:IX=LEN temporary$
3050 REPEAT IX=IX-1
3060 UNTIL MID$(temporary$,IX,1)=CHR$32 OR IX=0
3070 =MID$(temporary$,IX+1)
3080
3090 DEF FNcarry
3100 LOCAL flag,IX:flag=-1
3110 FOR IX=0 TO 4
3120 IF carrying(IX)<0 flag=IX
3130 NEXT
3140 =flag
3150
3160 DEF FNobject_nothing3
3170 LOCAL IX,flag:flag=-1
3180 FOR IX=0 TO 10
3190 IF INSTR(object$(IX),thing$) flag=IX
3200 NEXT
3210 =flag
3220
3230 DEF PROCdig
3240 ok=TRUE
3250 IF FNpossess(10)<0 PRINT "You need a spade!" :ENDPROC
3260 PRINT "digging..."
3270 FOR I=1 TO 5
3280 SOUND 0,-15,4,1:SOUND 0,0,0,9:SOUND 0,-15,5,9:SOUND 0,0,0,9
3290 energy=energy-1
3300 NEXT
3310 holes(Y%)=LEFT$(holes(Y%),X%-1)+0+RIGHT$(holes(Y%),7-X%)
3320 ENDPROC
3330
3340 DEF PROCdrop
3350 ok=TRUE
3360 IF LEN command$<6 PRINT "Drop what?":PROCinput
3370 command$=FNlast_word(command$)
3380 AZ=FNobject_no(command$)
3390 BZ=FNpossess(AZ)
3400 IF AZ<0 OR BZ<0 PRINT "Error!" :ENDPROC
3410 carrying(BZ)=-1
3420 place(AZ,0)=X%:place(AZ,1)=Y%
3430 SOUND 1,-15,0,4
3440 ENDPROC
3450
3460 DEF PROCdrink
3470 ok=TRUE
3480 IF FNpossess(9)<0 PRINT "You haven't got anything to drink." :ENDPROC
3490 IF drunk PRINT "The can is empty." :ENDPROC
3500 drunk=TRUE
3510 PRINT "OK..."
3520 FOR IX=100 TO 200 STEP 1
3530 SOUND 1,-15,IX,1:SOUND 1,0,0,7
3540 NEXT
3550 PRINT "hic!"
3560 energy=energy+25
3570 IF energy>100 energy=100
3580 ENDPROC
3590
3600 DEF PROCget
3610 ok=TRUE

```

```

3620 IF LEN command$<5 PRINT "Get what?":PROCinput
3630 command$=FNlast_word(command$)
3640 BZ=FNobject_no(command$)
3650 IF BZ<0 PRINT "Error!" :ENDPROC ELSE IF place(BZ,0)<>X% OR place(BZ,1)<>Y% PRINT "Error!" :ENDPROC
3660 AZ=FNcarry
3670 IF AZ<0 PRINT "Pockets are full!" :ENDPROC
3680 PRINT "OK":carrying(AZ)=BZ:place(BZ,0)=0:place(BZ,1)=10
3690 ENDPROC
3700
3710 DEF PROCeat
3720 ok=TRUE:AZ=FNpossess(1)
3730 IF AZ<0 PRINT "Haven't got any food!" :ENDPROC
3740 PRINT "You feel better..."
3750 energy=energy+50:carrying(AZ)=-1
3760 IF energy>100 energy=100
3770 ENDPROC
3780
3790 DEF PROClook
3800 IF command$="look" PRINT "Look at what?":PROCinput
3810 command$=FNlast_word(command$)
3820 ok=TRUE
3830 IF INSTR(command$,"bug") OR command$="monster" PRINT "Ugh! it's horrible!" :ENDPROC
3840 AZ=FNobject_no(command$)
3850 IF AZ<0 OR FNpossess(AZ)<0 PRINT "You haven't got that!" :ENDPROC
3860 IF AZ=3 PROCnap ELSE PRINT "Seems ordinary."
3870 ENDPROC
3880
3890 DEF PROCnap
3900 CLS:COLOUR 129:ok=TRUE:CLOSE 3
3910 FOR IX=0 TO 9
3920 PRINT CHR$9;
3930 FOR JX=1 TO 10
3940 IF FNwall(JX,IX) COLOUR 129:VDU 224 ELSE IF MID$(holes(IX),JX,1) = "0" COLOUR 128:PRINT "0" ELSE VDU 9
3950 NEXT
3960 PRINT
3970 NEXT
3980 COLOUR 129:PRINT TAB(9,10);CHR$224;CHR$9;CHR$224;
3990 COLOUR 128:COLOUR 3
4000 FOR IX=0 TO 10
4010 IF bug(IX,1)<10 PRINT TAB(bug(IX,0),bug(IX,1));CHR$225
4020 NEXT
4030 COLOUR 2:PRINT TAB(place(0,0),place(0,1));CHR$227;TAB(X%,Y%);CHR$226
4040 PROCpause(3000):CLS
4050 ENDPROC
4060
4070 DEF PROChit
4080 IF INSTR(command$,"with")<0 PRINT "What with?":PROCinput
4090 command$=FNlast_word(command$)
4100 AZ=FNobject_no(command$)
4110 BZ=FNpossess(AZ)
4120 IF AZ<0 OR BZ<0 AND co

```



```

4140 IF flag=1:FX=FALSE
4150 FOR I=0 TO 10
4160 IF bug(I,0)=XX AND bug(
I,1)=YX flag=1
4170 IF bug(I,0)=XX AND bug(
I,1)=YX FX=TRUE
4180 NEXT
4190 IF flag<0 AND NOT FX PR
INT "It's too far away." :ENDPROC
4200 IF flag<0 AND FX PRINT "I
can't reach" :ENDPROC
4210 PRINT "Bump..." :SOUND 0,
-15,6,1
4220 IF command="fist" PRINT
"It bites your arm off! reme
mber energy-50" :ENDPROC
4230 IF RND(10)=1 OR AX=1 OR
AX=3 PRINT "You drop the 'fist' a
st word(object$(AX)):carrying(
BX)=-1:place(A2,0)=X:place(A2
,1)=Y
4240 IF AX=1 PRINT "Apple is a
quashed"
4250 IF AX=3 PRINT "Map ruined"
4260 IF AX=2 PRINT "Didn't bur
st this"
4270 IF AX=0 OR AX>3 strength
(flag)=strength(flag)-RND(5)

```

```

4280 IF AX=1 OR AX=3 place(A2
,0)=0:place(A2,1)=10
4290 IF strength(flag)<1 PRIN
T "Mazebug is dead." :bug(flag,
0)=0:bug(flag,1)=10:PROCdraw:
red=dead+1 ELSE IF strength(fl
ag)<4 PRINT "Mazebug is weak."
4300 ENDPROC
4310
4320 DEF PROCpause(delay)
4330 *FXZ
4340 KEYINKEY delay
4350 ENDPROC
4360
4370 DEF PROCinstructions
4380 PRINT STRING$(200,CHR$(2
5))
4390 MOVE 230,890:H=3:V=3:E
165="MAZEBUGS":CALL 8900,8165
4400 PRINT TAB(0,7)"The secre
d Golden Chalice has been take
n from the Great Temple by a ri
val wizard from a nearby city."
4410 PRINT "He has hidden it
in a maze of twisty, turny p
assages which are inhabited by
carnivorous Mazebugs."
4420 PRINT "After many days I
reveal you have reached the maz
e. You must find the Chalice a
nd return home with it. Once y
ou have entered you can't le
ave without it."

```

```

4430 PRINT "Use GO FORWARD, T
URN LEFT/RIGHT to move. (Discov
er the other commands yourself
!)."
4440 PRINT "Hit a key to sta
rt the adventure..."
4450 REPEAT UNTIL GET
4460 ENDPROC
4470
4480 DEF PROCassemble
4490 char=827:block=885:count
er=885:limit=886:string=883:l
engh=882:addr=880:x=876:y=870:
byte=878:height=874:width=879:
mode=873:data=872:data=802880
402:data(4)=801010004:K1=8020:V
X=8450:X2=8510:Y1=8312:os=1820
E AND 8FFFF
4500 B1=8900:FOR pass=0 TO 2
STEP 2:PX=BT:(OPT pass:LDA 835
5:LDA data,X:STA mode:LDA 8620
:BEQ error:LDA 8601:STA block:
LDA 8602:STA block+1:LDY #0:LD
A (block),Y:STA string:INT
4510 LDA (block),Y:STA string
+1:INY:INY:LDA (block),Y:BEQ e
rror:STA limit:LDA #0:STA coun
ter:loop5 LDY counter:LDA (st
ring),Y:STA char:LDA #10:LDX #
char:LDY #0:JSR 8FFF:JSR pri
nt:INC counter:LDA counter:CMP
limit:BCC loop5:RTS
4520 .error BRK:EQU 4:EQU 5
Big error!:BRK:print LDA Y%:

```

```

STA y:LDA Y2+1:STA y+1:LDA X%:
STA x:LDA X2+1:STA x+1:LDY #7:
loop1 LDA PX:BEQ error:STA he
ight:loop2 LDA x:STA X1:LDA x
+1:STA X2+1:LDA char+1,Y:STA c
har:LDA X1:CLC:ADC #A:STA Y1
4530 LDA Y2+1:ADC #0:STA Y2+1
:LDX #8:here LDA #0:BEQ error
:STA width:ASL byte:PHP:BCC ne
xt:loop3 JSR plot:next LDA X
1:CLC:ADC mode:STA X1:LDA X2+1
:ADC #8:STA X2+1:DEC width:BEQ
carryon:PLP:PHP:BCC next:BCC
loop3:carryon PLP:DEX
4540 BNE here:DEC height:BNE
loop2:BEY:BPL loop1:LDA y:STA
Y1:LDA y+1:STA Y2+1:RTS:plot
LDA #25:JSR os:LDA #69:JSR os:
LDA X1:JSR os:LDA X2+1:JSR os:
LDA Y1:JSR os:LDA Y2+1:JMP os:
3:NEXT
4550 ENDPROC
4560
4570 *KEYE *T:MOD=PAGE-8E00:
FORX=PAGE TO TOP STEP4:(X1-0
2)=15:NEXT:(Y1TOP-01)=255:MPAG
E=8E00:MOLD:MRUN:M
4580 *FX130,0,128

```

*This listing is included in this month's cassette tape offer. See order form on Page 53.*

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## Powerful alternative

**MARK SMIDDY** reviews Slogger's rom upgrade and ram cartridge

THE arrival of Slogger's new expansion 2.0 adds proof that the Electron has come of age.

Aided by the efforts of Slogger it has graduated into a powerful and serious home micro.

The main expansion for the Electron is via Acorn's Plus 1 or Slogger's own Rombox Plus. These do provide adequate expansion for most purposes, but there is room for improvement in the operating system. No doubt this was the idea behind Expansion 2.

Supplied on rom, the software is simply inserted in place of the old expansion rom inside the Plus 1 or Rombox Plus.

Users of older versions of the Rombox may find this a bit fiddly, but it only has to be done once. The same bugbear does not apply to the Plus 1 however.

On power up, if all is well as shown in Figure 1, \*HELP reveals that we have a whole new set of commands added to the expansion: BUFFER, JOYSTICK, RLOAD and RSAVE.

Users of Rombox Plus will already be familiar with the basic idea behind BUFFER and JOYSTICK although both have been upgraded

from their original format.

As Figure 11 shows, the \*HELP functions have been extended on Expansion 2 to allow more help on individual commands.

The command BUFFER is concerned with sideways or the shadow ram available to owners of the Slogger Master Ram board. Basically it configures almost 16k of sideways ram or 12k of shadow ram as an extended printer buffer.

This is particularly useful in printing long listings or working on a word processor such as View. It loads and fills the buffer and prevents the machine from hanging, and cuts out wait while the printer slowly dumps out screens full of text.

In case of a mistake, the printing can be halted and the buffer flushed by a couple of simple star commands without having to switch the Electron off and start again.

The JOYSTICK command is a way of implementing joysticks into some game software via Slogger's switched joystick interface reviewed in the May, 1987, issue of *Electron User*.

The two new commands are directly concerned with

sideways ram and are used to save rom images to disc and then reload them into sideways ram at a later date.

This can be very useful, especially if you have several cartridge based roms that you want to use at once.

What if you don't have a sideways ram bank? Slogger can provide the answer in the form of its new 32k, write protectable sideways ram cartridge.

Readers of *Electron User* will no doubt remember that enthusiastic review Roland Waddilove gave to ACP's battery backed sideways ram in last month's issue and they may well wonder what the difference is.

Frankly there is not a lot to choose between them. The ACP unit is better for making a permanent copy of two of your roms since the battery backup holds the information even after power off. The Slogger unit is more suited to being a printer buffer and rom in one.

The Slogger ram cartridge

also has the advantage that its software driver is an integral part of the Expansion 2 rom, and ACP's is supplied in ram with the package for you to copy to tape or disc.

The ACP cartridge has the advantage of write protection being built into the software, whereas the Slogger unit is configured through a plug and pin that protrudes from the top of the casing. Slogger tells us that a new model is currently being developed with software write protect and printer buffer protection.

This means that while your printer buffer is active you cannot accidentally overwrite it with a rom image, like this reviewer. I await its arrival with anticipation.

To sum up, Slogger's sideways ram provides an alternative sideways ram package and if bought with the Expansion 2.0, does offer a considerable saving and a very powerful piece of hardware. ■

```
*HELP
Electron Expansion 2.00
Printer, ADC, RS423

BUFFER
JOYSTICK
RLOAD
RSAVE

OS 1.00
```

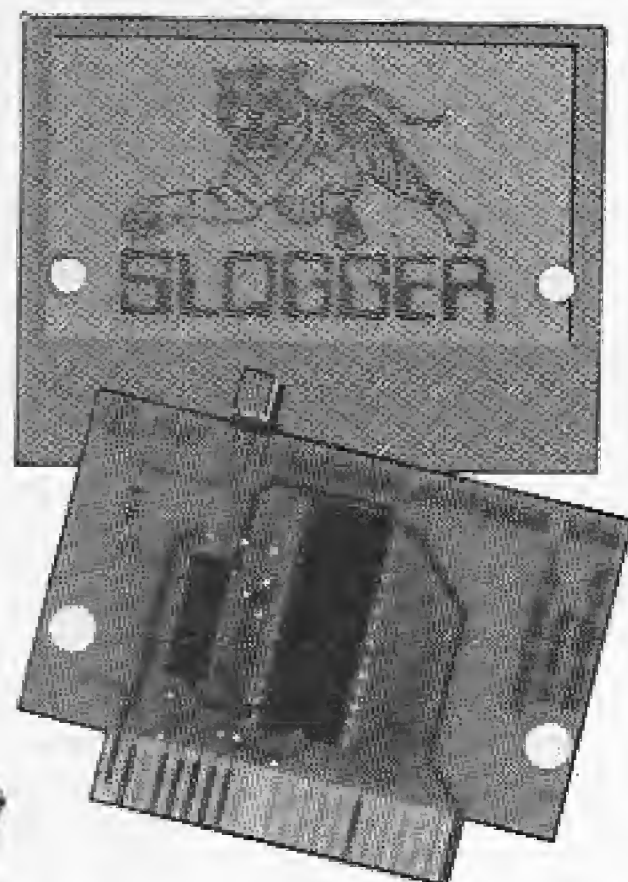
Figure 1: The Help Screen

```
>*HELP BUFFER
Electron Expansion 2.00

*BUFFER ON
*BUFFER OFF
*BUFFER FLUSH
*BUFFER PAUSE
*BUFFER RESUME
*BUFFER 64K

OS 1.00
```

Figure 11: Getting extra help on BUFFER



Product: Expansion 2 Rom  
Price: £11.95  
Supplier: Slogger, 107  
Richmond Road, Gilling-  
ham, Kent ME7 1LX.  
Tel: 0634 52303

Product: 32k Sideways Ram  
Price: £12.95  
Supplier: Slogger, 107  
Richmond Road, Gilling-  
ham, Kent ME7 1LX.  
Tel: 0634 52303



# Micro Messages

## Making the most of sideways ram

I HAVE been an avid reader of Electron User since you distributed it inside The Micro User and have found all the articles and reviews very comprehensive. I am sure these have influenced my purchases of various hardware.

At the moment I am using View with a Plus 3, Plus 1 and Brother M1009 printer. (I was very grateful to you for the excellent Printer Driver in the August 1986 issue). I am considering further expansion and wondered if anybody could answer my queries?

I am thinking of buying ACP's sideways ram. Can I use any of this extra 16k for my text? Also if I bought the Wigmore House Mouse could I use the 16k for better pictures?

Does the sideways ram come with adequate software to make rom images to load into sideways ram or must I buy ACP's rom manager? If it does can I backup roms and load them into sideways ram or must I unplug it and plug in a cartridge? And if I bought the rom manager will it backup itself?

Once I have got sideways ram I was considering buying ACP's E00 DFS. Does this mean I will have the

equivalent of a Plus 4 but with a 3.5in drive?

And one final thing, do you know how to configure a 5.25in disc drive from drive 0 to drive 1? Please let me know. — **Graham Dearing, Stockton-on-Tees, Cleveland.**

● You can't use the extra 16k of ram for text or pictures, only rom images. Software to copy and load roms is provided by ACP with the cartridge (please note that you can only copy your own roms for your own use). You can copy cartridges as well to save you plugging and unplugging them whenever you want to use them.

You don't need ACP's Advanced Rom Manager but, it is a useful toolkit to have around when you've got sideways ram. You'll find an article showing the many uses of sideways ram in the February 1986 issue of Electron User.

ACP's E00 DFS is the same as used in the Plus 4. If you are buying a 5.25in

drive ask for it to be set as drive 1. You can set it yourself but it involves opening the case (invalidating your warranty) and either removing one of the chips or altering a DIP switch.

## Shape shading

I HAVE owned an Electron for nearly three years now and ever since I started collecting Electron User my Basic programming has improved tremendously.

I have been trying to find a program that fills in objects of any shape. I know that PLOT 85 fills in triangles and I have a program that draws filled in circles and squares but, I cannot find a program to fill in an object of any shape. Can anyone help me with this? — **James Siddie, Merston, W.Yorks.**

● You'll find fill routines in the March 1985 and July 1986 issues of Electron User. Most shapes can be drawn using several triangles joined together using PLOT 85. In fact, this is how your circles and squares are drawn.

## Plus 4 software

DUE to the lack of software available on disc for the Acorn Electron and ACP Plus 4, I feel I must draw all Plus 4 users' attention to the only way in which we will ever receive disc software:

We must all club together and write or phone the major software companies such as Superior Software and Tynesoft to bring to their attention that there is a

profitable market in Plus 4 disc software.

I am afraid it is beyond me how the Plus 3 is considered to be a worthwhile market when it is inferior to the greater compatibility and ease of use that the Plus 4 offers.

I have already approached ACP on this issue and I hope that they will be able to give professional guidance and help to those who buy their goods.

When I phoned Superior they told me not enough people seemed to want Plus 4 disc software. If a time comes when there is sufficient demand they would consider it carefully.

Come on all Plus 4 owners, put pen to paper or mouth to phone and show the big software companies what an important part of the market we are. — **Paul Scranage, Leicester.**

## Escape codes

I HAVE had my Electron for about 18 months now and in the beginning bought Electron User at the newsagent. But since April of 1986 I have had the magazine sent direct because it is such good value for money and I like to receive it as early as possible.

Many of the articles I have read have certainly saved me hours of pondering what to do over a problem.

However, one problem I could not find a solution to in the magazine was what was meant in my Centronic printer's manual by those print codes that started ESC. For instance, ESC E n.

I did finally manage to work out that ESC was

Turn to Page 48 ►

## Beginner's blues

NO such line at one two five,  
Out of room! What is this jive?  
Bad command? Too many FORs?  
Type mismatch? What is the cause?  
String too long! Patience getting short,  
Not as easy as I first thought,  
This programming lark's hurting my head,  
Think I'll play a game instead.  
Out with the tapes, Snapper or Hopper?  
One thing's for sure, I'll come a cropper!  
Goodbye Mistake, farewell Bad MODE,  
Just got to wait for the game to load.  
But what's this I see, oh horror, oh shock,  
A Rewind tape and a Data and Block!  
I throw up my arms in bitter despair,  
And give the screen an angry glare.  
Enough I cry. That's it I blub,  
I'm off to find a friendly pub!

— **M.Hopewell, Nottingham.**



#### ◀ From Page 47

CHRS(27), which is mentioned in the VDU code table in the Electron hand book as reserved.

Finally, I have become a video camera buff and I am looking for a titling program for my Electron, (there are programs available for the Spectrum and the Commodore 64). Can anyone help me? — D.G.W. Rance, Eltham, London.

● ESC E n means the Ascii escape code 27, the Ascii code for E and a number n. To send these codes to the printer enter:

```
VDU 2,T,27,T,ASC"E",1,n,3
```

The 2 at the start switches the printer on and the 3 at the end switches it off. The printer codes in between are directed to the printer port by preceding them with a 1.

## Coffee tip

I RECENTLY wrote that part three of the View tutorial would be the best. My hopes were justified. Part three is one of the best pieces of utility software and it compliments View in a very professional way.

I didn't like the suggestion of building up a dictionary as mentioned in part three and thought of using previous listings I had already typed in. The obvious one was an early program found in the March 1984 issue of Electron User — Coffee.

The problem was how to use it. The Plus 3 user guide provides the answer. Take the Coffee listing and delete all but the data. This can be \*SPOOLed to disc and you now have a View file that you can use to build a dictionary. — A.Osborne, Hadfield, Cheshire.

## Spelling Checker tips

THANK you for publishing the View Spelling Checker in the May 1987 issue of Electron User. One problem I

**WHAT** would you like to see in future issues of Electron User?

**What** tips have you picked up that could help other readers?

**Here** is your opportunity to share your experiences.

**Remember** that these are the pages that you

write yourselves. So tear yourself away from your Electron keyboard and drop us a line.

The address is:

Micro Messages  
Electron User  
Europa House  
68 Chester Road  
Hazel Grove  
Stockport SK7 5NY.

met was that if you have a file that you want to check on a separate disc from your dictionary you can't change disc. To overcome this just add these lines:

```
215 INPUT"Change disc and  
press RETURN":*MOUNT  
475 INPUT"Change disc and  
press Return":*MOUNT
```

Another problem is that you can't list the dictionary, so I wrote a lister program. When run use Control+Shift to pause. At the end you will be told how many words there are.

```
10 REM Dictionary Lister  
20 REM By W.Buttigieg  
30 MODE 6  
40 ON ERROR REPORT:PRINT  
"":VDU13,10:PRINT"Press an  
y key to restart":REPEAT UN  
TEL GET:RUN  
50 PRINT"What is the nam  
e of the dictionary?":INPUT  
AS  
60 T=0:OSCLI"EXEC."+AS  
70 T=T+1  
80 YOU 1:INPUT BS:IF BS<  
>:* GOTO 70  
90 PRINT""There are "  
;T;" words in the diction  
ary."END
```

I have been buying Electron User for almost a year now and think it is brilliant. Well done! — Wayne Buttigieg, Staines, Middlesex.

● You can also \*LIST the dictionary to check and count the entries.

This command is built in to the DFS but ADFS users will find this utility on the Welcome disc. Alternatively you can simply load the dictionary into View and read at your leisure.

There were a couple of minor errors to look out for in this program. Firstly our

printer had a breakdown and all the underline characters were accidentally printed as minus signs.

Luckily they are quite easy to spot and most readers managed to get the program running. Secondly, always end your View file with a blank line or two as the last byte of the file is missed.

## DIP switch settings

WITH any program involving printing I have to type:

```
+FX6,B
```

If possible I include it at the beginning of a program and this I did for Wimps. However, when printing out notepad (PROCprint), the text was all jumbled up on one line with no line feed though printing out a card was alright.

After experimenting with PROCprint I altered line 960 from VDU 13 to VDU 10 and the printout was then ok. Was the VDU 13 an error or is there a better solution to my problem?

Thank you for a very compact and versatile utility. — N. Gill, Camberley, Surrey.

● Wimps works fine with our Epson FX-80 printer so it sounds like yours is not quite Epson compatible. You may be able to solve the problem by setting one of the DIP switches in the printer so that it accepts carriage returns. You'll have to look up the position and switch number in your manual.

## Adventure tip

MANY BBC Micro Adventures run on the Electron, particularly when using the Slogger Master Ram Board in 64k mode. The appearance of the text is however, often spoilt by Mode 7 control characters which appear in Mode 6 as unsightly random characters.

These can be removed by chaining this 'cleanup' program before loading the adventure.

```
10 REM Cleanup  
20 WRCHV=&20E  
30 FOR optX=0 TO 3 STEP 3  
40 FX=&900  
50 C OPT optX  
60 .init  
70 LDA WRCHV  
80 STA ret_vec  
90 LDA WRCHV+1  
100 STA ret_vec+1  
110 LDY #intcpt AND &FF  
120 LDY #intcpt DIV &100  
130 SEI  
140 STX WRCHV  
150 STY WRCHV+1  
160 CLI  
170 RTS  
180 .intcpt  
190 CMP #128  
200 BMI exit  
210 LDA #32  
220 .exit  
230 JMP (ret_vec)  
240 .ret_vec  
250 EQUW 0  
260 J  
270 NEXT  
280 CALL .init
```

I would be interested to hear from any Electron owners in the North London/Herts area. I use a Plus 1 with an AP4 disc interface and would be interested to compare notes with any Plus 3 disc users. — D.Aulton, 5 Lynford Gdns, Edgeware, Middx, HA8 8TX

## Front page news

I WOULD like to redefine one of the keys on the Electron to make it function as a Tab key. I have tried using:

```
*KEY1 YOU 9
```

but have had no success. I want to do this so that I can use Fleet Street Editor. This program is written for the BBC Micro and uses the Tab



key as a toggle.

Apart from this it appears to work, but of course may have other problems which I have yet to discover. I hope you can help. — Neil McLean, Edinburgh.

● The Tab key on the BBC Micro produces Ascii code 9. This is the same as pressing Control+I on the Electron, (I is the ninth letter of the alphabet). If this doesn't work try redefining a function key:

\*KEY9 11

However, this may still not work as the program could be looking at the hardware directly using a negative inkey value. In this case nothing can be done.

## Printer interfaces

I AM the owner of an Electron and want to attach a printer to it. Could you please tell me what is needed to do this, and perhaps at the same time advise me on a book that will expand my vocabulary to include computer speak. — D. Binting, Birch Vale, Cheshire.

● The Electron hasn't got a printer port so you'll have to buy an interface such as the Plus 1 or Rombox Plus. Make sure the printer has a Centronics interface, and you'll need a printer lead as well.

There are many books available for the novice — have any readers found a particularly good one? Trevor Roberts' excellent Basics series which started in the September 1986 issue of *Electron User* is aimed at the beginner and explains many of the terms used in programming.

## Musical Micro

AFTER some pathetic attempts to make music on my Electron I wondered whether it is possible to change the rather dull bleep created by the machine into something a bit more interesting.

I HAVE owned an Electron for a couple of years, but I have a problem. Whenever I use it lines of about one inch flicker across the screen. I have tried the computer with two televisions, but the display is the same.

A television engineer said it was radar blips. This couldn't be the reason because I've tried my computer at a friend's house and it works perfectly.

The computer has been checked twice and no fault has been found. I also own a Spectrum and this also has the same lines on screen. Is it anything to do with the electricity?

I have heard that the Music 500 works with the Electron using one of ACP's interfaces. Is this true? When can we expect the price of the Electron to rise

The user guide only mentions changing sounds using the ENVELOPE command, but this appears to make only 'police car' noises.

I have heard much more impressive sounds on the BBC Micro and would like to know if the Electron can produce anything like these. — Henry Doyle, Leigh-on-Sea, Essex.

● The Electron has only one sound channel compared with three on the BBC Micro so is at a disadvantage when it comes to producing music.

It is possible to create some super sound effects for games and some pleasing single channel music. Keyboard Player in the February 1987 issue of *Electron User* will help you compose, record and playback music.

## Praise and passwords

WELL DONE Superior Software! I am of course referring to the brilliant new

as I paid £200 for mine?

I know someone who has Acornsoft's GXR rom for the BBC Micro. The front cover of the user guide says "For the BBC and Acorn Electron". On page 99 of the Electron user guide the PLOT statements 96-255 are reserved for the graphics extension rom. Where can I get one? — Stuart Sharp, Brighton, Sussex.

● As your Electron works perfectly at your friend's house it is safe to assume that it is ok and that the fault lies elsewhere. Your Spectrum also displays the same fault so it looks like either the computers or your televisions are picking up interference.

It could be the mains — there are adaptors which fit into the mains socket that suppress mains interference

— but it could also be a neighbour with a powerful CB radio.

At the last Manchester Electron and BBC Micro user show Advanced Computer Products demonstrated the Music 500 working with an Electron and Plus 5. Contact ACP for details.

We hope the Electron doesn't rise in price. At just over £60 it is excellent value for money and you can't find a better micro for the price.

We tried Acornsoft's GXR rom when it was first released and unfortunately, it didn't work in an Electron. There are other roms available that will give you some of the extra commands provided by GXR for instance, Vine Micros' Addcomm and Slogger's Stargraph.

compilation Superior Hits Volume 3.

I was given a Plus 3 disc drive for Christmas and was pleased when I received news that Superior Software was thinking of converting some Electron games on to 3.5in disc and rushed my order off.

I am delighted with it. I think that Gary Partis — author of Synchron and Psycastria, is fab! I hope to see more games on disc for

the Electron from Superior in the near future, including Strykers Run.

Thanks for a great magazine. I look forward to getting it every month and sit and read it for hours.

I have also completed Tynesoft's The Big KO. Here are the eight passwords: SWITCH, POSTER, GUNSTAR, LOGICAL, SPIKE, JOHNBOY, WINDOW, START. — David Cox, Skelton, Yorks.

ALL programs printed in this issue are exact reproduction of listings taken from running programs which have been thoroughly tested.

However on the very rare occasions that mistakes may occur corrections will be published as a matter of urgency. Should you encounter error messages when you type in a program

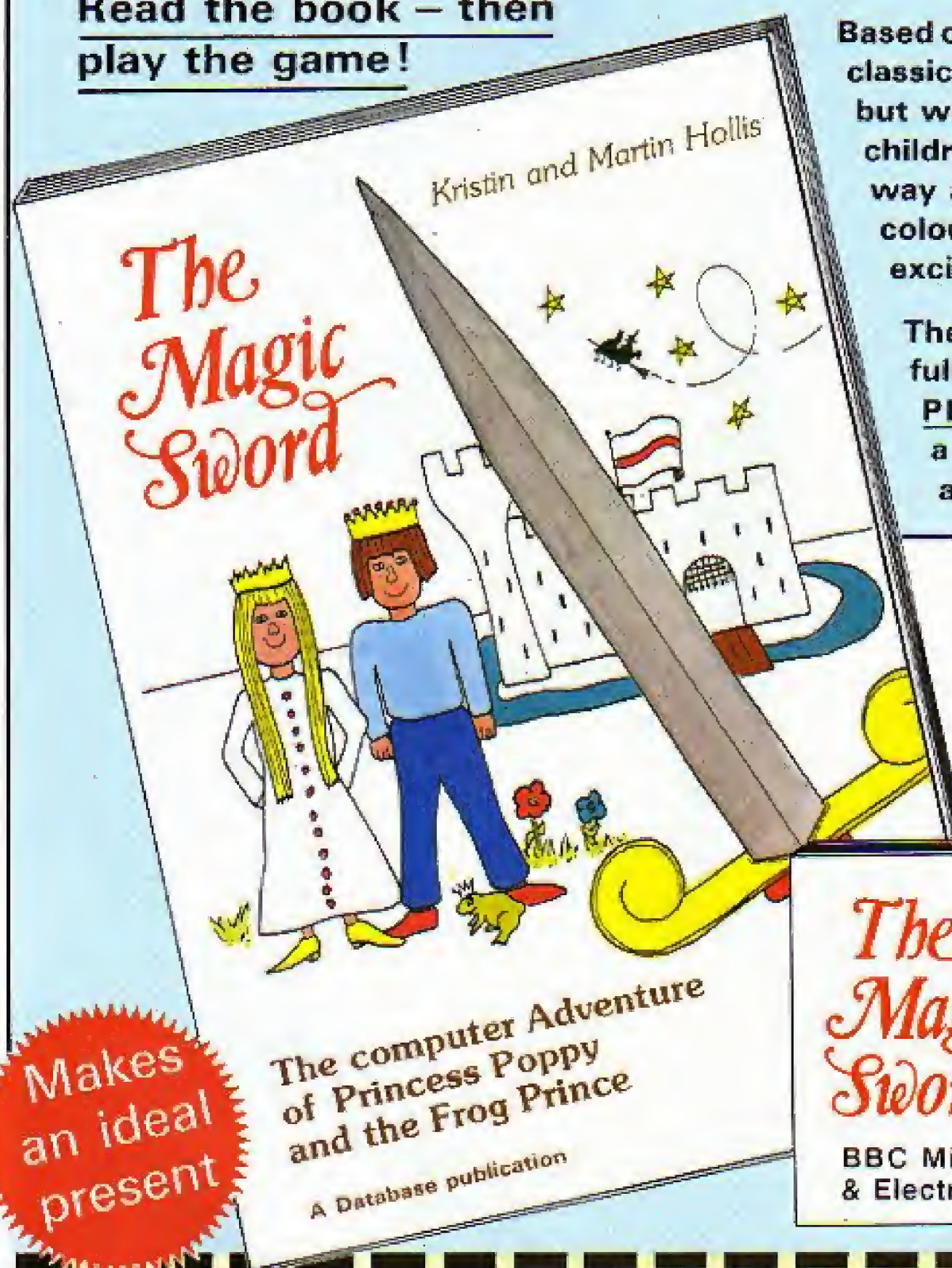
they will almost certainly be the result of your own typing mistakes.

Unfortunately we can no longer answer personal programming queries concerning these mistakes. Of course letters about suggested errors will be investigated without delay, but any replies found necessary will only appear in the mail pages.



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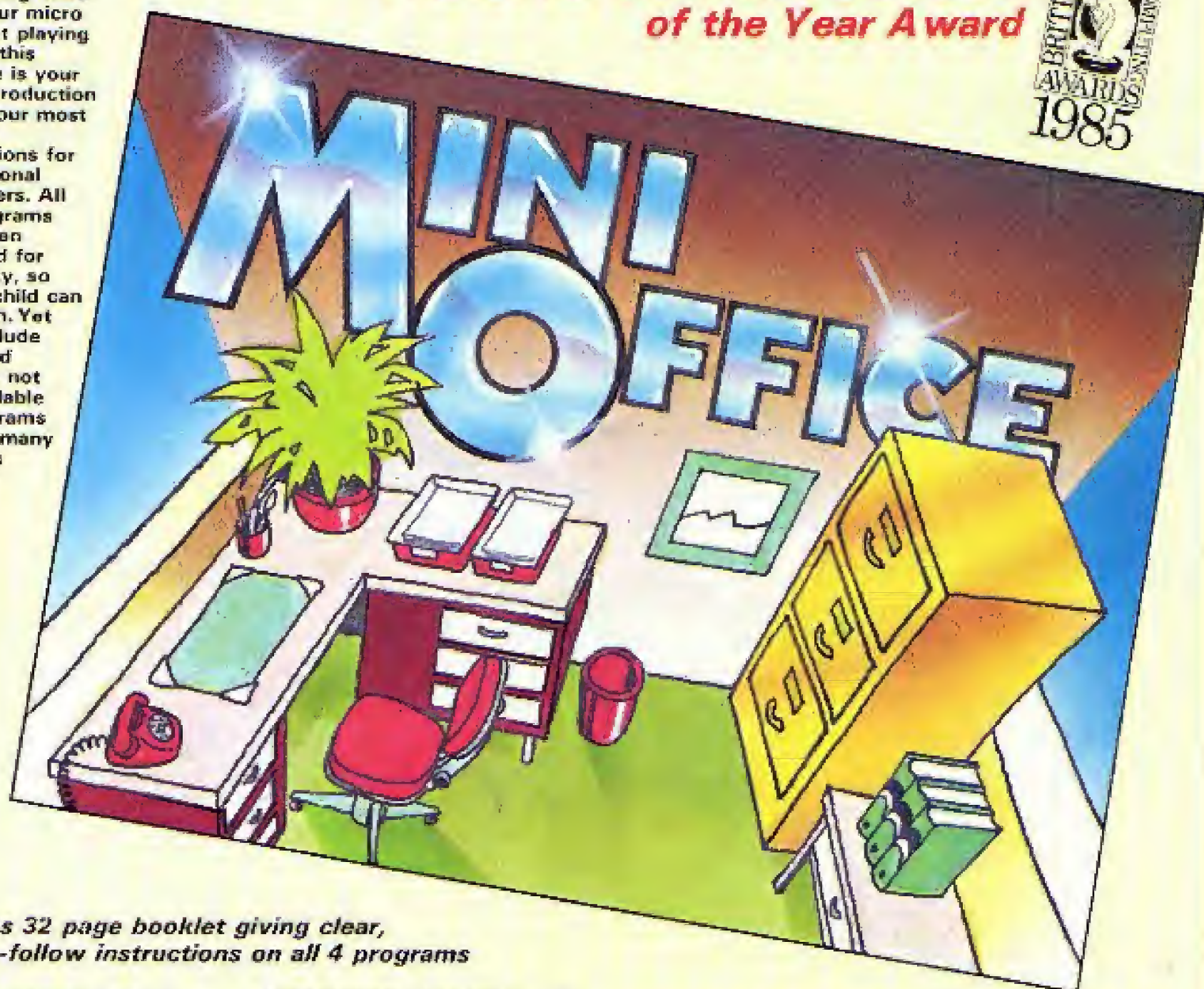
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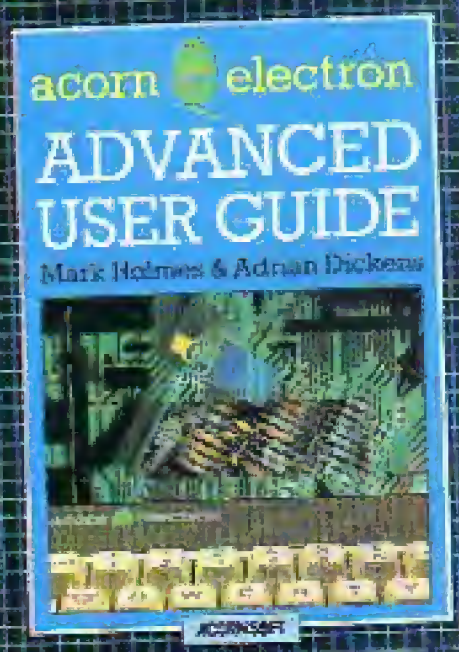


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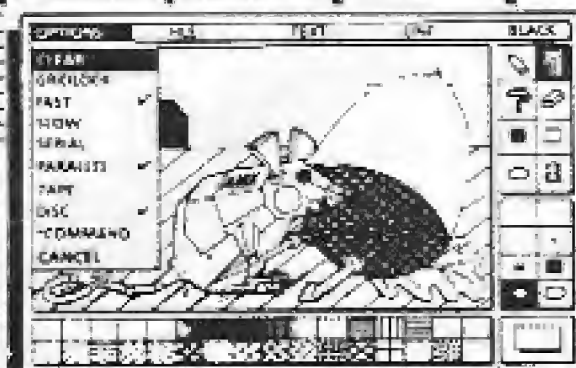
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(14)/E+ASR/

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# Building up from the atoms

LAST month I introduced you to Lisp, the language of artificial intelligence. This unusual and quite old language is widely used, particularly on large main-frame computers.

We saw that Lisp is a LIST Processing language used to manipulate symbols and lists of symbols.

This makes it ideal for programs designed to deal with the complexities of language and speech. Written languages are after all, merely lists of symbols.

Let's start by looking at a group of commands called predicates. These are simply Lisp's way of asking questions and are used to discover the nature of symbols and lists.

The sort of questions we can ask are whether something is true or false. Lisp will reply T for true and NIL for false. There are many built-in commands to ask questions and you can add your own if you need more as we'll see in next month's article.

The two most fundamental concepts in Lisp are the atom and the list. As you might expect there are commands which will tell whether a particular object or item of data is an atom or list.

Plug your cartridge in or load Lisp from tape and enter:

```
(ATOM 'fred)
```

and you'll see Lisp reply T to this question. Lisp asked: "Is this item an atom?" and the T indicates that *fred* is indeed an atom. The single quote before *fred* tells Lisp to take the word literally. It simply means the characters *f r e d* and nothing

## ROLAND WADDILOVE explains the predicate functions in Part II of his guide to Lisp programming

more.

Similarly we can test for lists with:

```
(LISTP (fred))
```

and Lisp replies T — the answer to the question "Is this thing a list?" is True.

There are two important points to notice: A list is something enclosed by brackets and an atom is a single word (or number). LISTP ends with a P indicating that it is a predicate. But not all predicates end in P — ATOM doesn't as we've seen.

Try switching these two questions around:

```
(ATOM '(fred))  
(LISTP 'fred)
```

and check that NIL is printed

each time.

Now that we can distinguish between an atom and a list, let's move on to look at the contents of lists.

Two of the most common functions in Lisp S-expressions (syntactically correct expressions), are CAR and CDR. Last month we saw that CAR gave us the first item in a list and CDR gave us what is left after taking away the first item. So:

```
(CAR '(a b c))
```

is the atom *a*. We can prove that it's an atom with:

```
(ATOM (CAR '(a b c)))
```

which asks "Is the first item

of the list (*a b c*) an atom?". In this case the answer is T. However, try this:

```
(ATOM (CAR '((a)(b)(c))))
```

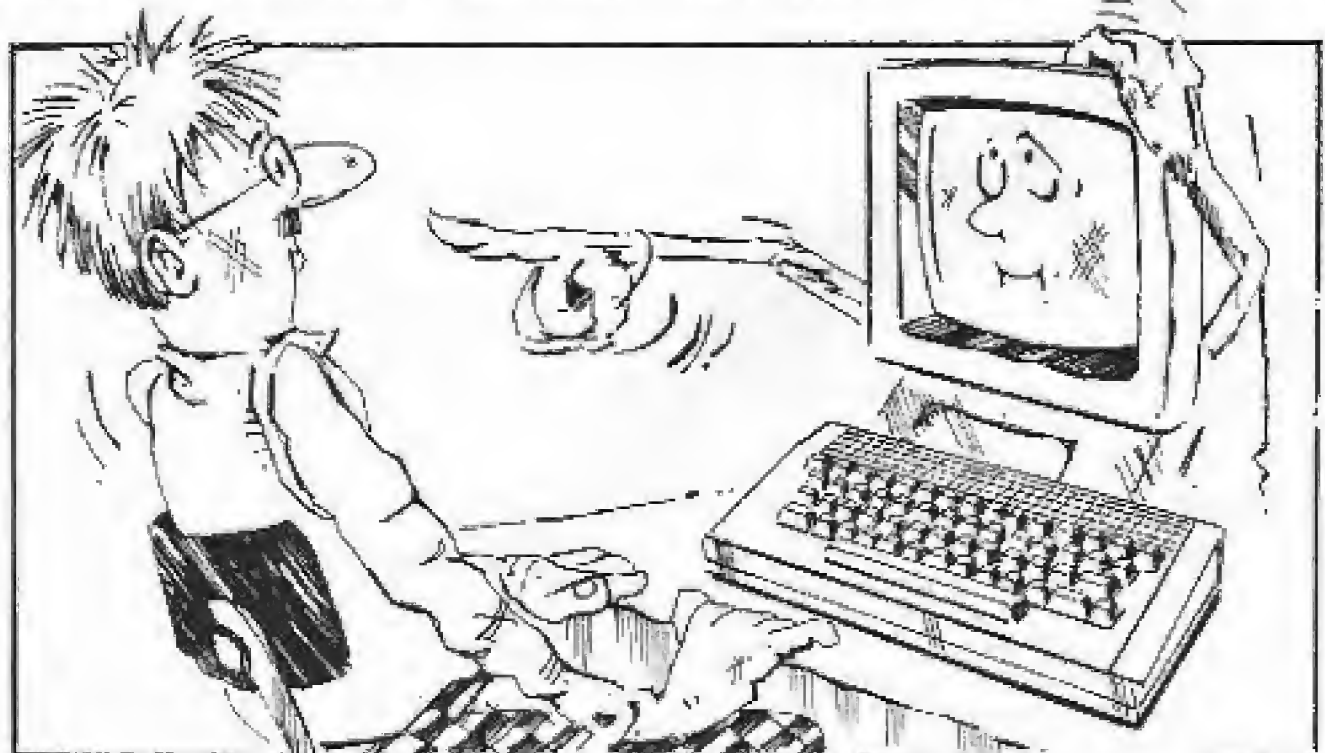
and the answer is NIL. That's because the first item is the list (*a*). Prove this with:

```
(LISTP (CAR '((a)(b)(c))))
```

and the answer Lisp prints is T.

Is the CDR of a list an atom or a list? We can use the same S-expressions as before but this time replacing CAR with CDR. Enter:

```
(ATOM (CDR '(a b c)))  
(LISTP (CDR '(a b c)))  
(ATOM (CDR '((a)(b)(c))))  
(LISTP (CDR '((a)(b)(c))))
```



Predicates: Lisp's way of asking questions



## LISP

```
Evaluate : (ATOM (CAR '(a b c)))
Value is : T
Evaluate : (NULL '())
Value is : T
Evaluate : (SETQ x 'Hello)
Value is : Hello
Evaluate : (SETQ y '(This is a list))
Value is : (This is a list)
Evaluate : (CAR y)
Value is : This
Evaluate : (CONS x y)
Value is : (Hello This is a list)
Evaluate :
```

Try replacing the list *(a b c)* with some of your own and confirm that CDR always results in another list. It can never give an atom.

A list need not have any items at all and *()* is a valid list – called a NULL list. NULL is in fact a question and can be used to ask "Is this item a NULL list?". The result is either T or NIL. You can see this with:

```
(NULL 'leggs and bacon)
(NULL '())
(NULL '(()))
```

Notice that the last S-expression is NIL – it is a list of NULL lists as:

```
(NULL (CAR (())()))
```

shows.

There are more predicates acting on lists, but for the moment we'll take another look at atoms. Remember that an atom is an item not enclosed by brackets. So *fred*, *jim*, *57* and *-4* are all atoms.

How can we tell whether an atom is a number or a string of characters? As we've seen ATOM tells us when we have an atom and LISTP when we have a list so you can probably guess

that NUMBERP tells us when we've got a number. CHARP, (not CHARACTERP) tells us when we've got a string of characters:

```
(ATOM 57)
(NUMBERP 57)
(ATOM 'fred)
(CHARP 'fred)
(CHARP 57)
(NUMBERP 'fred)
```

Notice that numbers don't need a quote in front of them. That's because we can let Lisp evaluate a number. The value of the atom *57* is *57*. But *fred* hasn't got a value so the quote prevents Lisp from evaluating it.

Can you guess what MINUSP, ZEROP and ONEP do? The P indicates that they are predicates – they ask questions which have either true or false answers. MINUSP tests for negative numbers, ZEROP tests for zero and ONEP tests for one. Enter:

```
(MINUSP 256)
(MINUSP -12)
(ZEROP 5)
(ZEROP 0)
(ONEP 1000)
(ONEP 1)
```

Finally GREATERP and LESSP take two arguments and test whether the first number is larger or smaller

than the second:

```
(GREATERP 5 6)
(GREATERP 574 263)
(LESSP 5 6)
(LESSP 574 263)
```

Let's pause for a moment and examine how Lisp handles variables. Unfortunately, Lisp uses variables in a totally different way to Basic. That means you must forget everything you've learnt when programming in Basic.

Lisp uses SETQ to give an identifier a value. In other words, we can give a variable name an associated value. For instance, to set *x* equal to *5* and *y* equal to *six*:

```
(SETQ x 5)
(SETQ y 6)
```

Prove that they do actually have these values by entering:

```
x
y
```

A point worth noting is that Lisp evaluates each S-expression when you enter it and the value is printed out. So when you enter:

```
(SETQ fred 546)
```

Lisp evaluates this and tells you that it is equal to *546*. This property can be used to set one variable equal to another and is quite commonly found in Lisp programs. For instance, to set *x* and *y* equal to *10* we could use:

```
(SETQ x (SETQ y 10))
```

Lisp always evaluates the innermost bracket first so *y* is set to *10* by the inner SETQ. The value of this S-expression is *10* so *x* is set to *10* by the outer SETQ.

That takes care of numeric variables, but what about strings? These are in fact handled in exactly the same way as numeric variables and we can use SETQ with any value:

```
(SETQ x 'Hello)
(SETQ y '(This is a list))
```

Don't forget the single quote and if there is more than one word enclose the

string in brackets making it a list. You can test these two assignments by entering *x* and *y* as before. Lisp will evaluate them and print the result.

Now that we can set the value of variables let's put them to good use. If you entered the last example *y* will be equal to *(This is a list)* and the CAR of this should be the atom *This*.

So much for the theory, does it actually work in practice? Enter:

```
(CAR y)
```

and you should see the result *This* printed. We don't want a quote in this example as *y* is a variable and we want Lisp to evaluate it.

Last month we looked at the command CONS which can be used to CONSTRUCT lists. It takes two arguments, an atom and a list and adds the atom onto the head of the list.

Try it with *x* and *y* – we should be able to CONS the atom *x* on to the list *y*. Enter:

```
(CONS x y)
```

Lisp will tell you that the result of this operation is the list *(Hello This is a list)*.

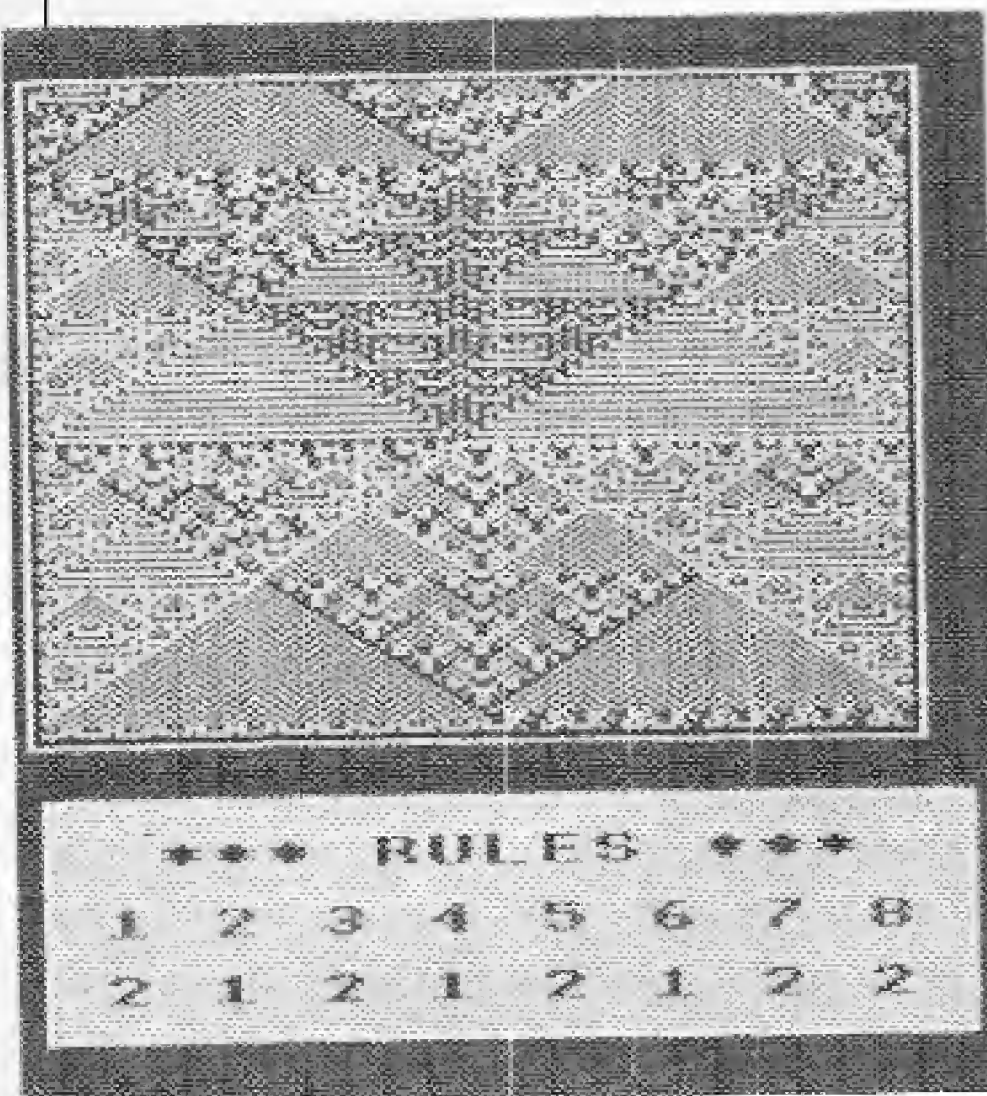
The more you experiment with these simple commands the easier Lisp will become. Try creating some variables of your own using the commands we've learnt so far. Here are a few examples to get you started:

```
(SETQ n1 60)
(SETQ n2 20)
(GREATERP n1 n2)
(SETQ fred '(a list))
(LISTP fred)
(CONS n1 fred)
(CONS n2 (CONS n1 fred))
(ATOM n1)
(NUMBERP fred)
```

If you can follow that lot you're well on your way to becoming a Lisp programmer.

● *That's all for now, there is plenty of material here to keep you occupied until next month when we'll see how to define our own functions.* ■





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new generation bringing out a new pattern.

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This can be a set pattern or a random spread. In this Electron version the seed pattern is set, but it can easily be altered by changing the PLOT commands in lines 250 and 260.

Consider a single cell – a coloured pixel on the screen. This can have up to three neighbouring cells occupying the three positions immediately above it as shown in Figure 1. Each cell can be one of three types, indicated by its colour – 1, 2 or 3 (0 indicates no cell).

To discover the future of a particular cell we add the colour numbers of the three cells immediately above it.

The colours range from 0 to 3 and there are three cells which produces a result in the range 0 to 9.

Ten rules can be drawn up indicating what the outcome is to be (eight can be altered from the main screen).

For instance, if the result is zero then a cell of colour two could be born. If the result is one the cell could be colour three and two might mean that the cell dies out – colour zero and so on.

This process is repeated for each row of cells and the new generation is calculated by examining the previous one. By tinkering with the rules you can generate

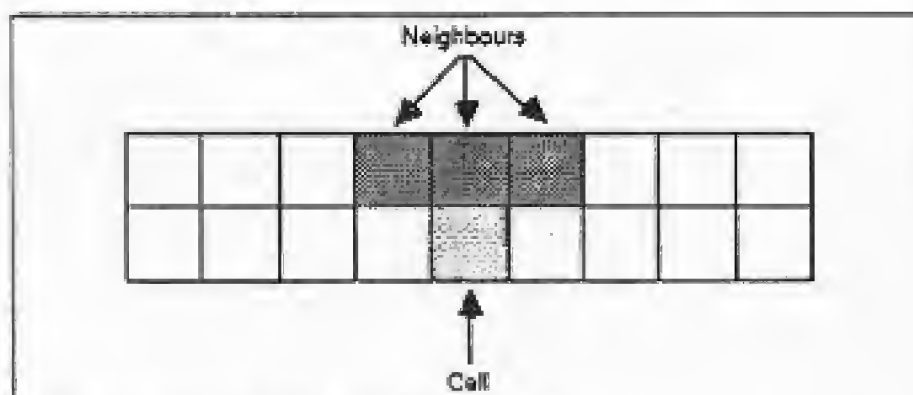


Figure 1: Each cell has three neighbours

many different and interesting patterns.

Run the program and tap the Escape key to start the colony growing. When you've seen enough, tap the Escape key again to clear the pattern. Now try changing the rules by pressing the keys 1 to 8. To see

the effect on the colony again press Escape.

There are many different patterns to generate and it would take a long time if you were to view them all. Experiment with the rules – there are some fascinating screen displays just waiting to be discovered. ■

```
10 REM Automaton
20 REM By Andrew Richards
30 REM (c) Electron User
40 MODE 8:PF16
50 PROCassemble
60 MODE 5:PF229,1
70 PROCinitialise
80 REPEAT
90 PROCrules
100 CALL 4900
110 UNTIL FALSE
120 END
130
140 DEF PROCrules
150 PROCwindow
160 PF178,255
170 COLOUR 3:PRINT TAB(4,5)
180 COLOUR 2:PRINT TAB(3,1)
190 COLOUR 0:COLOUR130
200 REPEAT KX=GET
210 IF KX>ASC"0" AND KX<ASC"9":KX=KX-48:table?KX=(table?KX+1)MOD 4:PRINT TAB(1+KX*2,28)CHR$(table?KX+48):CHR$(7
220 UNTIL KX=27
230 PF178
240 PROCwindow
250 SCOL 0,3:MOVE 128,956:
PLOT 1,128+8-8,0
260 SCOL 0,2:PLOT 69,648,9
56
270 ENDPROC
280
290 DEF PROCwindow
300 COLOUR128:VDU26,28,2,2
0,12,2,12,26
310 ENDPROC
320
330 DEF PROCinitialise
340 VDU23,1,0,0,0,0:
350 VDU23,224,170,85,170,8
5,170,25,170,85
360 COLOUR129:CLS
370 SCOL 0,2:DRAW 0,1023:0
RAW 1278,1023:DRAW 1278,0:DR
AW 0,0
380 COLOUR1:COLOUR128:FOR I
X=1 TO 19:PRINTTAB(1,IX)STR
INGS(16,CHR$(224)):NEXT
390 FOR IX=22 TO 28:PRINTT
AB(1,IX)STRINGS(17,CHR$(224)):
NEXT
400 VDU28,2,29,18,23:COLOU
```

```
R130:CLS
410 GCOLD,3:MOVE 128,32+9:
PLOT 1,64+17,0:PLOT 1,0,-32+
7:PLOT 1,-64+17,0:PLOT 1,0,3
2+7
420 COLOUR0:PRINTTAB(2,1)
*** RULES ***
430 COLOUR1:PRINTTAB(1,3)
1 2 3 4 5 6 7 8
440 COLOUR0:PRINTTAB(1,5)
2 1 2 1 2 1 2 1
450 VDU 24,120,400-60,112+
130+8,960:CLG:VDU26
460 GCOLD,3:MOVE 112,964:0
RAW 120+130+8,964:DRAW 120+1
30+8,400-60:DRAW 112,400-60:
DRAW 112,964
470 ENDPROC
480
490 DEF PROCassemble
500 X=350:Y=852
510 count=854
520 Lcount=855
530 byte=856
540 loopcounter=857
550 Yfag=858
```

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**MicroLink**

```
560 color=859:1859=8511001
00
570 Xreg=860
580 table=890:1table=80201
0201:table!4=802010201:table
18=80101
590 gcol=8359
600 FOR pass=0 TO 2 STEP 2
610 PX=8900
620 LOP1 pass
630 SEI
640 .start
650 JSR scroll
660 JSR decode
670 JSR generation
680 LDX 8F4:LDA 8F8:STA 8F4
:STA 8F05:LDA 89FF:STX 8F4
:STX 8F05
690 AND #1:BEQ start
700 CLT
710 RTS
```

```
720
730 .generation
740 LDA #185820+2+8140)MOD
255:STA screen+1
750 LDA #185820+2+8140)0LV
256:STA screen+2
760 LDY #0:LDX #0
770 .loop
780 STX Xreg
790 LDA #0:CLC
800 LDA pixel,Y:ADC pixel+
1,Y:ADC pixel+2,Y:TAX
810 LDA table,X:TAX:LDA co
lor,X:ASL A:STA byte
820 INY
830 LDA pixel,Y:ADC pixel+
1,Y:ADC pixel+2,Y:TAX
840 LDA table,X:TAX:LDA co
lor,X:ORA byte:ASL A:STA byt
e
850 INY
860 LDA pixel,Y:ADC pixel+
1,Y:ADC pixel+2,Y:TAX
870 LDA table,X:TAX:LDA co
lor,X:ORA byte:ASL A:STA byt
e
880 INY
890 LDA pixel,Y:ADC pixel+
1,Y:ADC pixel+2,Y:TAX
900 LDA table,X:TAX:LDA co
lor,X:ORA byte
910 INY
920 LDX Xreg
930 .screen STA 86000,X
940 TXA:CLC:ADC #8:TAX:BNE
loop
950 RTS
960
970 .decode
980 LDA #185821+2+8140)MOD
256:STA addr+1
990 LDA #185821+2+8140)0LV
256:STA addr+2
1000 LDY #0:STY pixel
1010 .loop
1020 .addr LDA 86000:STA by
te
1030 LDA #4:STA Lcount
1040 .loop2
1050 INY
1060 LDA byte:LDX #0
1070 AND #838:BEQ .ink
1080 INX
1090 CMP #838:BEQ .ink
1100 INX
1110 CMP #838:BEQ .ink
```

```
1120 INX
1130 .ink
1140 TXA:STA pixel,Y
1150 ASL byte
1160 DEC Lcount:BNE loop2
1170 CLC:LDA addr+1:ADC #8:
STA addr+1:LDA addr+2:ADC #8
:STA addr+2
1180 CPY #128:BCC loop
1190 LDA #0:STA pixel+1,Y
1200 RTS
1210
1220 .scroll
1230 LDA #185827+20+8140)MO
D256:STA old+1:STA new+1
1240 LDA #185827+20+8140)01
V256:STA old+2:STA new+2
1250 DEC old+1
1260 LDX #19+8
1270 LDY #0
1280 .loop
1290 .old LDA 85800,Y
1300 .new STA 85800,Y
1310 TYA:CLC:ADC #8:TAY
1320 BNE loop
1330 LDA old+1:AND #7:BNE n
ot.bot
1340 SEC:LDA old+1:SBC #839
:STA old+1:LDA old+2:SBC #81
:STA old+2
1350 DEC new+1
1360 DEX:BNE loop:RTS
1370 .not.bot
1380 DEC old+1
1390 LDA new+1:AND #7:BNE n
ot.bot
1400 SEC:LDA new+1:SBC #839
:STA new+1:LDA new+2:SBC #81
:STA new+2
1410 DEX:BNE loop:RTS
1420 .not.bot
1430 DEC new+1
1440 .next
1450 DEX:BNE loop:RTS
1460
1470 .pixel EQU STRING$(14
0,CHR$(0))
1480 J
1490 NEXT
1500 ENDP
```

This listing is included in this month's cassette tape offer. See order form on Page 53.





# Electronic evolution with the biomorphs

ANYONE watching Horizon on BBC 2 a couple of months back about Darwinian evolution could not fail to be impressed by the simulated evolution of the little figures known as biomorphs.

I was so taken by it that I laid down my soldering iron and started to program my own version for the Electron.

The principles of the simulation are explained in chapter 3 of Richard Dawkins' book *The Blind Watchmaker*. He demonstrates that dramatic large scale development of organisms may be achieved by the accumulation of numerous small changes.

The appearance of any creature is determined by its genes which are passed on to its offspring to produce near identical creatures. However, every so often one of the genes mutates or changes slightly resulting in a significantly different creature.

If this creature has a slightly increased chance of survival then it will prosper and an increasing number of the population will carry the same gene pattern. Eventually the whole of the population may contain the same gene types.

In our computer simulation, to save time, each offspring acquires one mutated gene from its parents.

We can then choose the child to breed from for the next generation. This is more like selective breeding

## MIKE COOK, doing his best to improve on nature

than natural selection, but if you equate the ability to please the selector with chances of survival, then it amounts to the same thing.

The small creatures in the simulation, christened biomorphs by Dawkins, are controlled by six genes. In Dawkins' original simulation there were nine, but the display and memory constraints on the Electron necessitate a little simplification.

The basic shape is a simple bifurcating tree drawn by a recursive procedure and each gene controls some aspect of the drawing — shown in Table 1.

It is not important to understand what the genes do. In fact it could be considered to be an undue influence on your selection. However, the way colour is handled does need a little explanation.

Each biomorph is basically two coloured and at each level of recursion the colour number is incremented by some fraction depending upon a gene value.

At an incremental value of one the colour changes every recursion level so if this increment is small the biomorph might not change colour at all.

Another gene controls the two colours actually dis-

played on screen.

When this mutates a third colour, selected at random, can be substituted in place of any one of the colours used.

Due to the limitations on the number of colours that can be displayed on a Mode 1 screen, this third mutated colour is also used for drawing the boxes and labelling the biomorphs. The two colours of the biomorph may well map to the same displayed colour, in which case the creature will be of a single colour.

When you run Biomorphs you are invited to choose the starting position for your evolution. The choices are a microbe, where all the gene values are set close to the minimum, a random point chosen close to the minimum values or some pre-set point.

Using this last option you can continue breeding from where you left off if you have made a note of the gene values.

At the centre of the screen is the parent biomorph and in the 12 surrounding boxes are the mutated offspring. Each mutation contains only one gene different from its parent.

There are twelve offspring because each of the six genes can change by a positive or negative increment. Note that they all look very similar — there will only be slight differences between them. In fact, at the smaller sizes these differences might not be discernible.

The gene values are extremely interdependent and all their effects grow with increasing complexity.

You will be invited to choose an offspring from which to breed the next generation and this can be selected by pressing any key from A to L. If any other key is pressed the value of the parent's genes will be printed and the parent will be drawn.

There is nothing in the program to stop the biomorphs growing out of their boxes but this can be prevented by the appropriate selection of offspring to breed from.

Many creatures or shapes

Gene	Function
0	Depth of recursion used.
1	Basic size of line.
2	Branching angle.
3	Branching angle incremented at each new level of recursion.
4	Colour incremented at each new level of recursion.
5	Displayed colour.

Table 1: The genes



can be evolved. One simple one is shown in the screen dump in Figure 1. It is fun to give your creations names – I call these Bumble Bees.

You are not restricted to biological shapes, however; you can get a very good likeness to small space invader creatures or space ships.

This is a program that can be extensively tinkered with; the gene maximum, minimum and increments are all contained in data statements and can be easily altered. You could also include a feature to record the progress (gene values of each generation parent) of your creatures on disc file or printer.

In a sense, as Dawkins points out, you are not creating the creatures but discovering them. However, as the number of possible creatures is so large that the two processes become very similar.

The program as printed is capable of generating 120,736,980 shapes which, if you could view them at the rate of one per second, would take you just over 3.8 years to see them all – so get cracking!

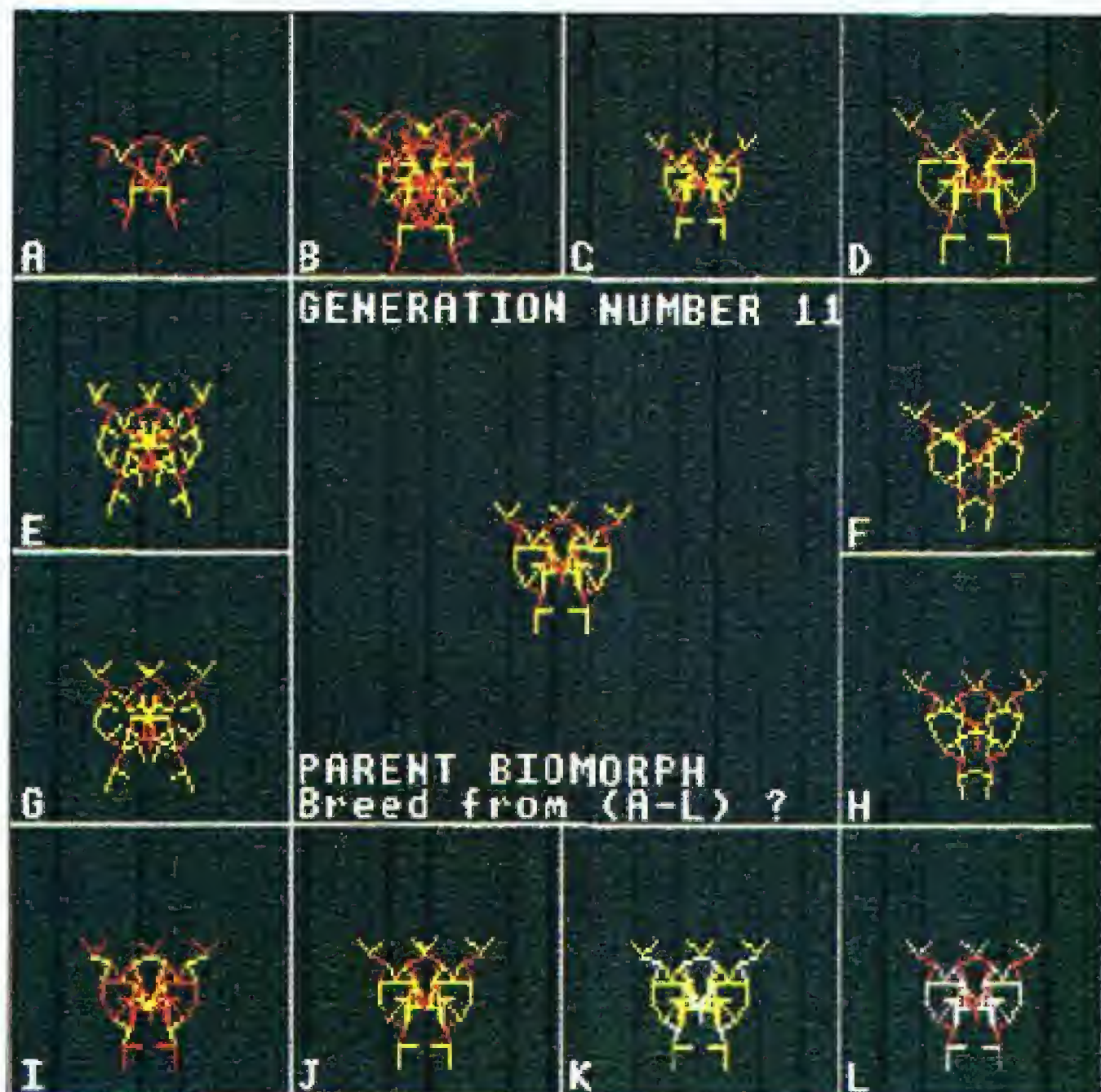


Figure 1: Burnble Bees

## Biomorphs listing

```

10 REM Biomorphs
20 REM By Mike Cook
30 REM (c) Electron User
40 MODE 1:FX16
50 DIM morph(5,12),parent(5)
)
60 DIM G1(5,2),PX(12),PY(12)
)
70 REM Read in increments
71 REM & limits of genes
80 RESTORE 130
90 FOR AX=0 TO 2
100 FOR BX=0 TO 5
110 READ G1(BX,AX)
120 NEXT: NEXT
125 REM Gene increments
130 DATA 1,4,0.16,0.16,0.1,0
135 REM Gene min
140 DATA 1,-36,-3.14,-3.14,0
,64
145 REM gene max
150 DATA 9,36,3.14,3.14,1,10
23
160 PROCINTPOS
170 PROCINTP
180 gn%=0
190 CLS:FX178
200 REPEAT
210 gn%=gn%+1
220 PROCmutate
230 PROCdisplay
240 PROCchose
250 UNTIL FALSE
255
260 DEF PROCINTP
270 IF AS="I" ENDPROC
280 parent(0)=1
290 parent(1)=4
300 parent(2)=0.785
310 parent(3)=1
320 parent(4)=1
330 parent(5)=BICA
340 IF AS="A" ENDPROC
350 FOR AX=0 TO 4
360 parent(AX)=(RND(7)+1)*G1
(AX,0)
370 NEXT
380 parent(0)=RND(3)+1
390 parent(5)=RND(7)+64+RND(
7)*B+RND(7)
400 ENDPROC
405
410 DEF PROCmutate
420 FOR BX=1 TO 12
430 FOR AX=0 TO 4
440 morph(AX,BX)=parent(AX)
450 IF (BX MOD 2) D=-1 ELSE
D=1
460 C=((BX-1)DIV 2)
470 IF C<>AX THEN 500
480 IF morph(AX,BX)+D*(G1(AX
,BX))<G1(AX,1) OR morph(AX,BX)+
D*(G1(AX,BX))>G1(AX,2) THEN 500
490 morph(AX,BX)=morph(AX,B
X)+D*(G1(AX,BX))
500 NEXT
510 NEXT
520 parent(5)=(parent(5) AND
63F) OR (RND(7)+64)
530 FOR BX=1 TO 12
540 morph(5,BX)=parent(5)
550 NEXT
560 ENDPROC
565
570 DEF PROCdisplay
580 PROCclines
590 PROCtree(parent(0),paren
t(1),parent(2),parent(3),paren
t(4),parent(5),640,500)
600 FOR AX=1 TO 12
610 PROCtree(morph(0,AX),mor
ph(1,AX),morph(2,AX),morph(3,A
X),morph(4,AX),morph(5,AX),PX(
AX),PY(AX))
620 NEXT
630 ENDPROC
635
640 DEF PROCINTPOS
650 RESTORE 920
660 FOR AX=1 TO 12
670 READ PX(AX),PY(AX)
680 NEXT
690 CLS
710 PRINT TAB(10,2)"COLOUR B
IOMORPHS"
720 COLOUR2:PRINT"An exerc
ise in Darwinian Evolution"
740 PRINT"By Mike Cook"
750 COLOUR3:PRINT"Based on
an idea by Richard Dawkins"
760 PRINT"Author of The bli
nd Watchmaker"
780 COLOUR2:PRINT"Options
to start evolving from:"
790 COLOUR1:PRINT"A - A mic
robe."
800 PRINT"B - Some random p
oint."
810 PRINT"C - A defined poi
nt."
820 COLOUR2:PRINT"Press A,
B OR C: ";
830 AS=GET$:PRINTAS
840 IF NOT(AS="A" OR AS="B"
OR AS="C") THEN 820
850 IF AS<>"C" ENDPROC
860 FOR A=0 TO 5
870 PRINT"Gene number ";A;"

```

Turn to Page 82 ►



## Biomorphs listing

### From Page 61

```

880 INPUT parent(A)
890 IF parent(A)>G1(A,2) OR
parent(A)<G1(A,1) PRINT:PRINT
"Values between "G1(A,1);" an
d "G1(A,2):6070 870
900 NEXT
910 ENDPROC
920 DATA 160,860,480,860,880
,860,1120,860,160,804,1120,804
,160,348,1120,348
930 DATA 160,92,480,92,800,9
2,1120,92
940 DEF PROCLines
950 CLS
960 VDU 23,1,0;0;0;0;
970 VDU5
980 PRINT
990 FOR X=320 TO 960 STEP 32
0
1000 FOR Y=256 TO 800 STEP 25
6
1010 MOVE X,0:DRAWX,1023
1020 MOVE 0,Y:DRAW 1259,Y
1030 NEXT
1040 NEXT
1050 MOVE 640,260:PLOT 7,640,
764
1060 MOVE 324,512:PLOT 7,956,
512
1070 FOR A=1 TO 12
1080 MOVE PX(A)-350,PY(A)-60
1090 PRINT CHR$(840+A)

```

```

1100 NEXT
1110 MOVE 330,322
1120 PRINT"Parent Biomorph"
1130 MOVE 330,755
1140 PRINT"Generation Number
";gn1
1150 VDU4
1160 ENDPROC
1165
1170 DEF PROCchoose
1180 VDU5:FX178,255
1190 MOVE 330,290
1200 PRINT"Breed from (A-L) ?
";
1210 *FX15,0
1220 AS=GET$
1230 PRINTAS;

```

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# MicroLink

```

1240 C=ASC(AS)-640
1250 IF C<0 OR C>12 PROCrevie
w:ENDPROC
1260 TX=parent(5) DIV 64
1270 IF C=11 parent(5)=(paren
t(5) AND 838) OR TX:GOTO1320
1280 IF C=12 parent(5)=(paren
t(5) AND 87) OR (TX*8):GOTO132
0
1290 FOR A=0 TO 5

```

```

1300 parent(A)=morph(A,C)
1310 NEXT
1320 VDU4:FX178
1330 ENDPROC
1335
1340 DEF PROCreview
1350 VDU22,1
1360 PROCtree(parent(0),paren
t(1),parent(2),parent(3),paren
t(4),parent(5),640,380)
1370 VDU19,3,7;0;
1390 PRINT"Current BIOMorph
has:-"
1400 FOR A=0 TO 5
1410 PRINT"GENE ";A; " VALUE "
;parent(A)
1420 NEXT
1430 PRINT TAB(0,30);"Press a
ny key to continue";
1440 AS=GET$
1450 gnX=gnX-1
1460 VDU22,1
1470 ENDPROC
1475
1480 DEF PROCtree(L,L,dA,dT,d
C,CM,X,Y)
1490 VDU19,1,(CM AND 7);0;
1500 VDU19,2,(CM DIV 8) AND
7;0;
1510 VDU19,3,(CM DIV 64) AND
7;0;
1520 IF AX=11 GCOL 0,3 ELSE 6
COL 0,1
1530 MOVE X,Y
1540 DRAW X,Y-L

```

```

1550 PROCgrow(P1/2,1+dC,X,Y,d
)
1560 GCOL 0,3
1570 ENDPROC
1575
1580 DEF PROCgrow(TH,C,X,Y,D)
1590 LOCAL CX
1600 IF D=0 ENDPROC
1610 CX=INT(C) AND 3
1620 IF CX=3 CX=1
1630 IF CX=0 CX=2
1640 GCOL 0,CX
1650 IF AX=11 AND CX=1 CX=3
1660 IF AX=12 AND CX=2 CX=3
1670 GCOL 0,CX
1680 MOVE X,Y
1690 dx=L*COS(TH+dA)
1700 dy=L*SIN(TH+dA)
1710 PLOT 1,dx,dy
1720 PROCgrow(TH+dA+DT,C+dC,X
+dx,Y+dy,D-1)
1730 GCOL 0,CX
1740 MOVE X,Y
1750 dx=L*COS(TH-dA)
1760 dy=L*SIN(TH-dA)
1770 PLOT 1,dx,dy
1780 MOVE X,Y
1790 PROCgrow(TH-dA-DT,C+dC,X
+dx,Y+dy,D-1)
1800 ENDPROC

```

This listing is included in this month's cassette tape offer. See order form on Page 53.

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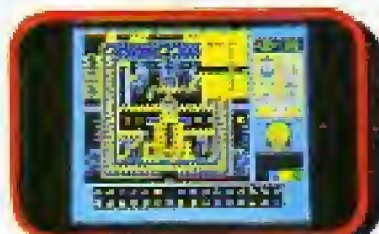
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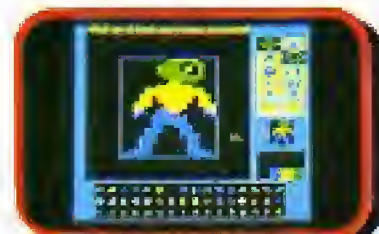
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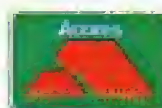
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